



Republic of Macedonia  
Municipality Bitola

## PROJECT APPRAISAL DOCUMENT

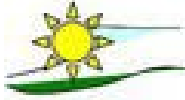
“Construction of seven streets with sidewalks,  
water supply system, storm water system and street  
lightening in the former military area ARM1 and  
ARM2 in Municipality Bitola”



World Bank  
Municipal Services Improvement Project

Skopje, April 2015

The Project's Appraisal Document was prepared by the Center for Promotion of Sustainable Agricultural Practices and Rural Development – CeProSARD, with the exception of Environmental Impact section prepared by the MSIP consultant Slavjanka Pejcinovska-Andonova.



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# 1.

## INTRODUCTION

In the former military barracks of Army of the Republic of Macedonia (ARM), a new settlement called "Zlaten Rid" is planned. According to the technical design the settlement is divided in three districts (1, 2 and 3). Only two districts (ARM district 1 and ARM district 2) in the settlement "Zlaten Rid" are considered for construction at this phase and therefore the project activities will be provided in this area. ARM district 1 has 327,400m<sup>2</sup> or 32.74ha not constructed land planned for construction of residential, commercial, cultural and educational buildings. ARM district 2 has 397,546m<sup>2</sup> or 39.75ha not constructed land planned for construction of individual houses. Located on urban public land, this area will represent the spirit of Bitola in the 21 century and will complement the old architecture in Bitola. Hence, in ARM district 1 the project assumes construction of streets with sidewalks, water supply system, storm water system and street lightening of three streets: SRU 2, SRU 3 and SRU 4, as well as construction of street with sidewalks, water supply system and storm water system of STU 5b in ARM district 1. In ARM district 2 the project assumes construction of water supply system, storm water system, construction of streets and street lightening of three streets: SRU 4, STU 7 and STU 12.

The project cost is lower than the borrowing capacity of the municipality, which provides no financial risk on loan repayment. The total lengths of streets that are subject of this appraisal are: 1,124.54m in ARM district 1 and 1,675.00m in ARM district 2, respectively the total length of streets planned for construction in the settlement "Zlaten Rid" is 2,799.54m. The project solution provides simultaneous placement of water supply system, storm water system, construction of streets with sidewalks and street lighting. With an approach like this the additional damage to the newly constructed streets and some partial solutions, which could cause damage to the newly constructed streets and sidewalks will be prevented.

However, it should be also emphasized that some of these streets are the main traffic arteries in both districts ARM district 1 and ARM district 2 which are very close and connected to the city center, whereby it can be inferred that the implementation of the project will have a wider indirect benefit on the community living in the municipality Bitola. The main purpose of the proposed technical solution is to provide a long range investment in the streets by construction of streets with sidewalks, water supply system, storm water system and street lightening, thus meeting the needs of the community in the municipality Bitola. At the same time, the purpose of the technical design is to provide convenience and safety for pedestrians and traffic by controlling storm water flows, within prescribed limits and to retain within each catchment as much storm water and run-off as possible given the planned use of the terrain and its civil engineering characteristics.

The proposed technical solution is in-line with the existing standards and positive regulation for this kind of projects, which implies that the implementation of the project is technically feasible. The project is also in accordance with the existing positive laws and regulations in the country. The relevance of the project comes from the fact that the municipality is obligated to ensure appropriate infrastructure (local roads, storm water system, water supply system, street lightening and electrification) to all settlements under its jurisdiction. This is regulated with the Law on Local Government (Official Gazette of the Republic of Macedonia 5/02) under the Article 22, List of competencies. The municipality should ensure that all residential and commercial buildings are connected to the water supply network and have an appropriate infrastructure after the construction of buildings is finished. According to the regulation, the period for construction of different kind of buildings is from 6 years (for private houses) to 10 years (for bigger buildings) after the investors receiving a construction permit. Because the municipality still is selling not constructed land in the settlement "Zlaten Rid", there is no risk of citizens to complain.

At the same time, the project is part of the general urban plan (GUP) of municipality Bitola and DUP for ARM district 1, 2 and 3. It will contribute towards achieving the vision of the municipal administration (the mayor and the municipal councilors) for providing full coverage of transport, storm water and other communal (utility) infrastructure throughout the municipal territory. It can be inferred that the implementation of the project will undoubtedly contribute towards improvement of the quality of life and well-being of the residents. Municipality has implemented various similar projects in the past, some of which in collaboration with international institutions, which implies that, is able to implement large construction projects such as this one. Also, municipality Bitola has already started the construction of one main street SrU1 in ARM1 with its own funds, and this construction is planned to be completed soon.

The project is relevant to the development objective of the MSIP because it is considered both cost-efficient and cost-effective, over a long run and also useful for the health of the residents and the environmental protection. No adverse social or environmental impacts were identified.

The cost-benefit analysis (CBA) showed the project is acceptable and desirable for implementation according to the methods used. In addition, the project will cause significant unquantifiable benefits such as increasing the traffic safety and comfort, increasing the traffic capacity and communications, ensuring a feeling of security by pedestrians, enhancing the commercial activities, as well as will allow normal every day activities of the residents who will live in the new settlement "Zlaten Rid".

Considering that "Zlaten Rid" is a new settlement, it is still not settled. However, there are some residents who live in the existing buildings in ARM1, while there are also new buildings under construction. The old buildings are connected on the existing water supply system and storm water system. This old water supply and storm water systems have not enough capacity to connect the new buildings. The new buildings are planned to be connected to the new storm water and water supply systems. Also, there are other buildings that already exist in ARM1, such as Faculty of Law, Faculty of Biotechnology, local television station "Mega" and training center for fire protection. In ARM2 the construction activities have not been started yet.

The present condition of the streets do not allow traffic and forces the residents who already work there to search for alternative routes, which ultimately results in fall of productivity. This mostly relates to the employees and students from the Faculty of Law and employees in "Mega" television and the training center for fire protection, while the other faculties have entrance from other location. The streets in the settlement "Zlaten Rid" are not recommended for use. The implementation of the project is expected to increase the property value for houses and other residential or commercial objects on the streets, thus increasing the growth of revenues from property taxes.

Furthermore, it is very difficult to relate the benefits of projects of this kind with the economic development and poverty levels in a certain municipality in a short-term. However, taking into account that the new settlement "Zlaten Rid" will have economic and commercial activities and services, the project will definitely have a wide positive impact on the economic growth and the poverty level, not only in a short term but also in the longer term perspective.



# 2.

## PROJECT DESCRIPTION



## 2.1 General information on municipality Bitola

The municipality Bitola is located in the south-western part of the Republic of Macedonia and according to the size of its territory is the fourth municipality in the country. It extends from the north-west to south-east. The location of the municipality is marked with an orange color on the figure below.

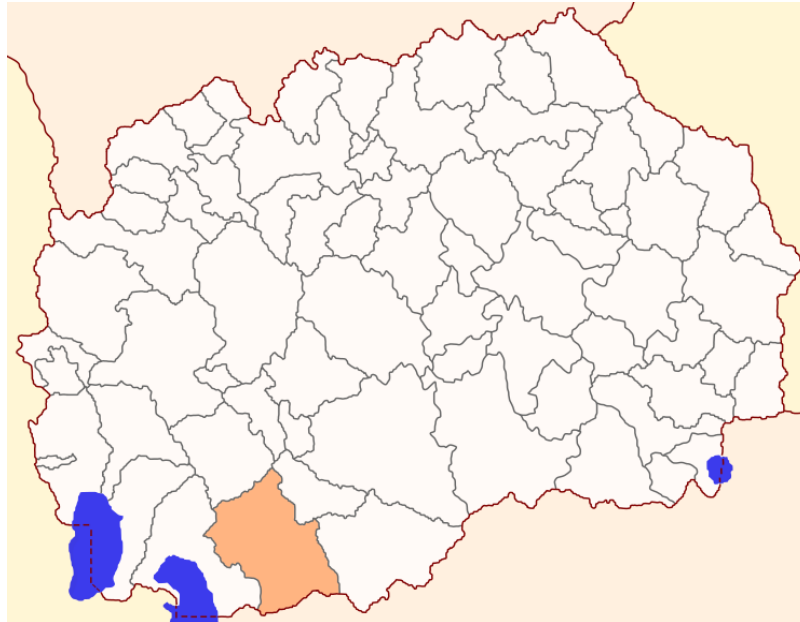


Figure 1 Location of the municipality Bitola  
Source: State statistical office

Municipality Bitola borders with the municipality Demir Hisar on the north, municipality Mogila and Novaci on the east, municipality Resen on the west and the Republic of Greece on the south. It has good geographical position and traffic connections because it is located in the Pelagonia Valley. The most important traffic and communicational directions are Bitola-Prilep (M-5) a main road that is connected to the highway that has an international meaning (M-1) and then Bitola-Ohrid (M-5) that is connected to the western main road. Also, through the municipality crosses the highway M-5, which connects the municipality with the northern and eastern part of the country and through the border crossing Medzillija-Niki, continuing to the neighboring Greece.

The city is also connected through a railroad in the direction Bitola-Prilep-Bogomila-Veles, and from there with directions to Skopje, Gevgelija or Stip. Bitola is connected by railroad with Greece, through Florina, Edessa and Thessalonica. This direction has lost its meaning since the definition of the state borders, which does not mean the present situation will remain unchanged in the future.

According to the morphological structure, the territory of the municipality comprises 66 settlements, and this is the biggest number in any municipality in Macedonia. All settlements within the municipality, together with the city of Bitola, are shown in the figure below. The average altitude is 753m, which is above the average in the country. The highest settlement is Drevenik with 1,200m and the lowest is Dolno Egri with 572m. According to the relative attitude of Pelagonija's Valley 51 settlements are lowland, while the others are hilly.

The city of Bitola is located in the foot of the mountain Baba with the top Pelister (2,601m m.a.s.l.) near the Greece border which is located 115km far away. The land where the city is located is sloping between 715m and 585m above the sea level, from west to east, i.e. between Pelister and Baba Mountain and Pelagonia Valley, by which the city has average altitude of 650m. These differences have significant influence on the appearance of the city and the structure of its landscape. Bitola is located in the area where are present two different arable sections, crop-gardening on east, north-east and south-east and orchard-gardening and livestock breeding on west and south-west. The city of Bitola is an administrative center of the municipality Bitola, but also the main regional center of the south-west region in the country. It is a university center with most of the existing faculties,

city with consular offices, museum, bars and restaurants.



Figure 2 Settlements within the municipality Bitola  
Source: State Statistical Office

Municipality Bitola, as well as the whole Pelagonia Valley is at a distance of 155 kilometers from the Adriatic Sea, and at about 130 kilometers from the Aegean Sea due to which should have an altered Mediterranean climate. However, the climate in Bitola has moderate-continental characteristics with an emphasized continental component, because of the closeness of the mountainous relief, the height above the sea level, the near-by valley etc., and these facts make the climate in Bitola and Pelagonia very dynamic and non-stable. The municipality has dry and very warm summer, and a rainy winter period, divided into a shorter cold and dry period, with the first maximum rainfall in autumn and the second one in spring.

According to the meteorological data, the average annual temperature is 11.1°C. The coldest month is January with an average air temperature of 0.6°C and absolute minimal temperature of -30.4°C. The warmest month is July with an average annual temperature 22.2°C and absolute maximal temperature 41.2°C. The absolute yearly dynamic of the air temperature is 71.6°C which is specific for the areas with continental climate. The average annual amount of rainfall is 601mm (usually between 338mm and 879mm rainfall).

Table 1 Temperature in municipality Bitola in °C

Month	Measurement unit	Temperature
The warmest month - July	average	22.2
	absolute minimum	-30.4
The coldest months - January	average	0.6
	absolute maximum	41.2
<b>Average annual temperature</b>		<b>11.1</b>

Source: Profile of Municipality Bitola, 2014

Table 2 Settlements in municipality Bitola

#	Settlements	Absolute attitude	Area (km <sup>2</sup> )	Inhabitants (in 000)		Agrarian structure (ha)			
				1994	2002	Agricultural land	Pastures	Forests	Total
	<b>Municipality Bitola</b>	<b>753</b>	<b>771.0</b>	<b>97,158</b>	<b>95,385</b>	<b>32,221</b>	<b>22,736</b>	<b>16,598</b>	<b>72,042</b>
1	Bareshani	690	6.9	212	205	376	160	124	660
2	Bistrica	630	5.7	965	1,015	419	98	2	519
3	Bitola	640	23.6	77,712	74,550	1,100	142	327	1,612
4	Bratin Dol	830	9.4	179	185	362	490	3	817
5	Brusnik	860	8.8	898	241	305	259	245	845
6	Bukovo	720	17.9	1,021	3,494	913	560	146	1,645
7	Velusina	695	16.0	134	160	807	382	358	1,547
8	Gabalavci	660	5.8	145	114	249	271	8	528
9	Gopes	1,160	9.3	2	-	90	130	700	920
10	Gorno Egri	585	-	-	-	-	-	-	-
11	Gorno Orizari	605	3.9	1,969	2,454	264	88	0	352
12	Graeshnica	680	19.2	216	190	457	372	1,059	1,888
13	Dihovo	830	12.1	160	310	501	218	446	1,165
14	Dolenci	790	7.7	281	265	218	82	420	720
15	Dolno Egri	572	-	-	-	-	-	-	-
16	Dolno Orizari	577	6.8	1,497	1,834	599	8	-	607
17	Dragarino	590	3.8	80	86	139	234	155	528
18	Dragozani	620	11.9	208	156	268	904	-	1,172
19	Dragosh	680	12.0	37	33	363	736	512	1,611
20	Drevenik	1,200	16.4	47	26	586	312	707	1,605
21	Gjavato	860	22.1	164	122	340	185	1,608	2,133
22	Zabeni	585	3.9	190	178	209	53	0	262
23	Zlokucani	980	19.1	20	-	113	1,180	605	1,898
24	Kazani	880	7.7	104	75	304	123	315	742
25	Kanino	670	5.3	127	111	259	161	96	516
26	Karamani	574	7.5	362	337	670	25	-	695
27	Kishava	860	19.6	431	308	324	304	1,313	1,941
28	Kravari	587	2.0	1,200	880	169	8	1	178
29	Kremenica	588	31.0	161	134	2,075	117	48	2,240
30	Krklino	670	10.3	609	611	491	455	27	973
31	Krstoar	700	3.8	187	167	214	96	-	310
32	Kukurecani	680	16.2	1,001	966	1,446	227	1	1,674
33	Lavci	760	9.9	338	338	231	411	144	786
34	Lazec	660	12.2	338	302	1,036	119	-	1,155
35	Lera	750	13.0	153	122	290	540	395	1,225
36	Lisolaj	700	20.1	275	225	754	1,148	19	1,921
37	Logovardi	578	16.8	726	699	1,527	10	4	1,541
38	Lopatica	780	24.4	322	280	694	1,338	329	2,361
39	Magarevo	1,040	16.1	90	87	254	203	609	1,066
40	Malovishte	1,140	29.3	121	98	153	668	1,675	2,496
41	Metimir	820	5.3	14	10	238	115	168	521
42	Medzitllija	820	-	176	155	-	-	-	-
43	Nizepole	1,030	46.7	227	186	225	4,230	200	4,655
44	Novo Zmirново	595	3.7	60	41	80	214	4	298
45	Oblakovo	1,100	9.9	1	1	209	333	126	698
46	Oleveni	650	4.7	154	157	301	148	1	449
47	Optichari	578	16.7	323	317	2,028	49	-	2,077
48	Orehovo	720	9.4	26	23	110	327	455	892
49	Ostrec	970	17.7	282	229	364	471	898	1,733
50	Poeshevo	578	7.1	254	272	670	6	-	679
51	Porodin	600	13.7	240	202	1,134	81	-	1,203
52	Ramna	820	7.3	86	61	310	267	112	689
53	Rastani	780	5.0	267	396	116	314	-	430
54	Rotino	920	10.3	184	113	373	175	12	960

55	Svinishte	-	-	-	-	-	-	-	-
56	Sekirani	665	12.4	126	114	280	935	1	1,216
57	Snegovo	-	-	-	-	-	-	-	-
58	Sredno Egri	576	22.1	344	299	2,028	49	-	2,077
59	Srpci	900	9.6	112	65	343	487	87	917
60	Staro Zmirново	850	-	13	10	-	-	-	-
61	Strezevo	-	-	-	-	-	-	-	-
62	Trn	573	12.0	120	113	1,059	64	4	1,127
63	Trново	960	6.3	301	278	203	217	192	612
64	Capari	1,010	33.6	590	493	892	669	1,612	3,173
65	Crnobuki	600	16.0	452	406	1,042	434	1	1,477
66	Crנוvec	650	14.0	124	86	647	334	324	1,305

Source: Popovski, V., Selmani, A. and Panov, N. (2006). Municipalities in the Republic of Macedonia, Local Government of the Republic of Macedonia and its Territory Division

According to the last revised Census of population and households (2005) in 2002 the total number of population in the municipality is 95,535 inhabitants and most of them (88.5%) are with Macedonian nationality. The number of residents has decreased for 1,777 or 1.8% since 1994. In the central settlement, the city of Bitola live 74,550 inhabitants and it is the largest city in the Republic of Macedonia, right after the capital city of Skopje with 467,257 inhabitants. The total number of residences is 37,225, i.e. 2.6 members live in every residence. The total number of households is 28,942, i.e. 3.3 members live in every household. In both cases they are below the average number in the country.

Municipality Bitola has 65 rural communities – villages and only one urban community – city of Bitola. According to the State Statistical Office, last revised Census data (2005) in 2002 most of the population lives in the city 78.2%, while the reminding 21.8% is rural population. Comparing to the population structure in the Republic of Macedonia, there is 57.8% urban population. Comparing to the previous Census in 1994 in municipality Bitola 80% is urban population, while the remaining 20% of the population lives in the rural areas. This indicated on gradual abandonment of villages and increased concentration of the population in the urban areas, which is especially represented in municipality Bitola.

The most prevalent in the agrarian structure is the cultivated agrarian soil with 32,223ha, pastures with 22,572ha and forests with 16,598ha. Bitola is a famous industrial center for growing and processing of grains, sugar, tobacco, beer, dairy products, gardening cultures and wine plantations. The most famous enterprises are ZIK Pelagonia, Bitola milk factory, Lozar, Transkop, the factory for production of sugar, the factory for production of beer and others.

## 2.2 Demographic and economic profile of municipality Bitola

### 2.2.1 Demographic profile

According to the last revised Census of population and households (2005) for 2002 the number of inhabitants in municipality Bitola is 95,385 and 28,942 resident households, with an average of 3.3 members per household. In 2013, the total number of population has decreased to 92,777 inhabitants. The fall of population is due to the decreasing of live births and rate of natural increase per 1000 inhabitants. Also, the number of immigrants in the municipality is lower in comparison with the immigrants in 2002. In 2002 there is a big difference between the total number of immigrants and emigrants, i.e. there are 171 emigrants more than the number of residents who immigrate in the municipality, while in 2013 this difference is lower for 119 residents who emigrated from the country. A statistical data about the population and migration in municipality Bitola, Pelagonia Region and the Republic of Macedonia are shown in the table below.

The city of Bitola represents highly immigration area of the population from the smaller settlements within the municipality, which additionally influenced the labor market. On the other side, most of the emigrants have academic education that indicates on outflow of highly skilled staff from the municipality.

Table 3 Main demographic indicators

Demography indicators	Municipality Bitola	Pelagonia Region	Republic of Macedonia
<b>Demography - according to the last revised census data for 2002</b>			
Total population	95,385	238,136	2,022,547
Natural increase per 1000 inhabitants	-2.6	-2.3	3.1
Live births per 1000 inhabitants	9.3	10.1	11.9
Total households	28,942	72,546	564,296
Average households members	3.3	3.4	3.6
Total dwellings	37,225	93,976	698,143
Total immigrated residents	377	1,022	11,861
Total emigrated residents	206	749	11,219
<b>Demography - State Statistical Office estimates for 2013</b>			
Total population	92,777	232,113	2,065,769
Natural increase per 1000 inhabitants	-3.3	-2.5	1.9
Live births per 1000 inhabitants	9.1	9.7	11.2
Total immigrated residents	356	922	8,405
Total emigrated residents	304	837	8,860

Source: State Statistical Office, MAKStat database, 2013; revised Census of population and households, 2005

The rates of population movement considering natural growth, births and migrations per year (from 2001 to 2013) of municipality Bitola are shown in the table below. Hence, the analysis shows negative average rates for all three indicators of population growth and movement through the years. In addition, an average natural growth rate is -0.2, average birth rate is -0.1 and average migration rate is 0.04. The average values of population movement in the municipality, without considering the city of Bitola, are quite similar with the overall trend of natural movement of population in the rural areas in the country.

Table 4 Decreasing of population in municipality Bitola

Year	Natural growth rate	Birth rate	Migration rate
2001	0.1	-0.8	-0.4
2002	-2.1	-0.7	-0.5
2003	0.2	0.0	0.3
2004	0.1	0.2	0.1
2005	-0.7	-0.2	0.6
2006	0.6	0.2	0.5
2007	-1.4	0.3	-0.1
2008	1.1	0.0	-0.1
2009	1.1	0.8	0.2
2010	-0.5	-0.1	-0.4
2011	-1.1	-1.0	0.7
2012	-0.9	0.0	-0.4
2013	0.7	-0.4	0.0
<b>Average</b>	<b>-0.2</b>	<b>-0.1</b>	<b>0.04</b>

Source: State Statistical Office, MAKStat database

Live births data for municipality Bitola, Pelagonia region and the Republic of Macedonia are shown in the table below.

Table 5 Live births according to gender

Year	Municipality Bitola			Pelagonia Region			Republic of Macedonia		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
2009	486	503	989	1,352	1,275	2,627	12,340	11,344	23,684
2010	480	496	976	1,314	1,217	2,531	12,631	11,665	24,296
2011	433	447	880	1,181	1,128	2,309	11,752	11,018	22,770
2012	433	448	881	1,237	1,125	2,362	12,243	11,325	23,568
2013	415	429	844	1,174	1,072	2,246	12,093	11,045	23,138
<b>Average</b>	<b>449</b>	<b>465</b>	<b>914</b>	<b>1,252</b>	<b>1,163</b>	<b>2,415</b>	<b>12,212</b>	<b>11,279</b>	<b>23,491</b>

Source: State Statistical Office, MAKStat database

The analysis of live births through years in municipality Bitola shows bigger number of female babies than males, which is different compared to the live births in the Pelagonia region and the overall country. In addition, according to the State Statistical data, there is a decreasing of live births through years which is the same in Pelagonia region and the Republic of Macedonia. This indicates aging of the population in the country, especially in the smaller local communities.

The next table gives an overview of a gender structure in municipality Bitola compared to the Pelagonia Region and the Republic of Macedonia. The data shows bigger number of female population in municipality Bitola, while Pelagonia region and the country have the same share of gender, representing an increased share of male population over the female population.

Table 6 Population according to the gender in 2013

Gender	Municipality Bitola		Pelagonia Region		Republic of Macedonia	
	Number	Share	Number	Share	Number	Share
Male	45,603	49.2	116,289	50.1	1,034,841	50.1
Female	47,174	50.8	115,824	49.9	1,030,928	49.9
<b>Total</b>	<b>92,777</b>	<b>100</b>	<b>232,113</b>	<b>100</b>	<b>2,065,769</b>	<b>100</b>

Source: State Statistical Office, MAKStat database 2013

The age distribution and its share in the total population in municipality Bitola, Pelagonia Region and the Republic of Macedonia in 2013 are shown in the following table.

Table 7 Population according to the age structure in 2013

Repartition	Municipality Bitola		Pelagonia Region		Republic of Macedonia	
	Number	Share	Number	Share	Number	Share
0	852	0.9	2,221	1.0	22,913	1.1
1-4	3,696	4.0	9,713	4.2	93,301	4.5
5-9	4,428	4.8	11,877	5.1	112,351	5.4
10-14	4,520	4.9	11,914	5.1	119,851	5.8
15-19	5,169	5.6	13,493	5.8	137,385	6.7
20-24	6,150	6.6	15,660	6.7	155,698	7.5
25-29	7,383	8.0	17,659	7.6	164,394	8.0
30-34	7,290	7.9	17,353	7.5	162,384	7.9
35-39	6,184	6.7	16,030	6.9	153,564	7.4
40-44	5,956	6.4	14,917	6.4	146,353	7.1
45-49	6,472	7.0	16,416	7.1	147,433	7.1
50-54	7,071	7.6	16,775	7.2	141,756	6.9
55-59	7,657	8.3	17,535	7.6	134,995	6.5
60-64	6,214	6.7	14,960	6.4	117,663	5.7
65-69	4,179	4.5	10,909	4.7	87,896	4.3
70-74	3,641	3.9	9,390	4.0	70,067	3.4
75-79	3,177	3.4	8,116	3.5	53,549	2.6
80 and more	2,735	2.9	7,151	3.1	43,857	2.1
unknown	3	0.0	24	0.0	359	0.0
<b>Total</b>	<b>92,777</b>	<b>100</b>	<b>232,113</b>	<b>100</b>	<b>2,065,769</b>	<b>100</b>

Source: State Statistical Office, MAKStat database 2013

Most of the population in municipality Bitola is Macedonian (88.7%). From the other minorities there are: Albanians (4.4%), Roma (2.7%), Turks (1.7%), as well as Vlachos (1.3%) and other nationalities with lower share than 1%, such as: Serbs, Bosnians, etc. The minority repartition is shown in the table below. Macedonian population prevails in the Pelagonia region as well, while the Albanian population takes the second place.

Table 8 Population according to ethnic affiliation in 2002

Repartition	Municipality Bitola		Pelagonia Region		Republic of Macedonia	
	Number	Share	Number	Share	Number	Share
Macedonians	84,616	88.7	119,855	84.0	1,297,981	64.2
Albanians	4,164	4.4	7,525	5.3	509,083	25.2
Turks	1,610	1.7	5,917	4.1	77,959	3.9
Roma	2,613	2.7	4,655	3.3	53,879	2.7
Vlachos	1,270	1.3	1,071	0.8	9,695	0.5
Serb	541	0.5	328	0.2	35,939	1.8
Bosnians	21	0.1	2,606	1.8	17,018	0.8
Others	550	0.6	794	0.6	20,993	1.0
<b>Total</b>	<b>95,385</b>	<b>100</b>	<b>142,751</b>	<b>100</b>	<b>2,022,547</b>	<b>100</b>

Source: State Statistical Office, revised Census of population and households, 2005

## 2.2.2 Economic profile

Considering the State Statistical Office data for 2013, the following table presents infrastructure, education and economic data for municipality Bitola, Pelagonia Region and the Republic of Macedonia. In municipality Bitola there are 198 health and social institutions, 370 transport and storage institutions and 12 water supply and sewage management institutions. The transport in the municipality is organized through 167km local streets from which 156km are asphalted.

There are 55 educational institutions, from which 12 primary and 7 secondary schools. Primary schools have 38 regional units and secondary schools provide lectures in socio-humanistic area, natural science and mathematics, technology and music. Also, there are 2 kindergartens, 1 institute and 1 state university with 8 academic institutions that provide undergraduate and postgraduate studies in the field of technology, economy, education, biotechnology, administration and management and medicine. In 2013/2014 study year there were 7,464 children in the primary and 4,300 children in the secondary school. There are more than 15,000 students attending studies at the academic institutions at the state university "Ss. Kliment Ohridski" Bitola<sup>1</sup>. At the municipality operate 3,957 business subjects, while the GDP per capita is calculated on a regional level, since there are no available data on the municipality contribution.

Table 9 Main macroeconomic indicators

Macroeconomic indicators	Unit	Year	Municipality Bitola	Pelagonia Region	Republic of Macedonia
<b>Infrastructure</b>					
Local streets	km	2013	167	1,211	9,471
Health and social institutions	Number	2013	198	428	3,315
Transport and storage institutions	Number	2013	370	809	6,095
Water supply, sewage disposal and waste management institutions	Number	2013	12	29	306
<b>Education</b>					
Educational institutions	Number	2013	55	118	1,025
Children that attend primary school	Number	2013/2014	7,464	19,655	191,051
Children that attend secondary school	Number	2013/2014	4,300	9,379	86,418
Population literacy at age 10 and more	Number	2002	83,045	204,031	1,693,044
Women literacy at age 10 and more	Number	2002	41,712	100,081	829,755
<b>Economy</b>					
Active business subjects	Number	2013	3,957	8,268	71,290
GDP per capita	MKD	2012	-	218,463	226,440

Source: State Statistical Office, MAKStat database, 2013; revised Census of population and households, 2005

<sup>1</sup> Municipality Bitola, <http://www.bitola.gov.mk/>, accessed: 28.01.2015

According to the last revised Census data for 2002 the total number of population in age of 15 years and over (working age population) in municipality Bitola is 78,929; economically active people are 43,278, of whom 67.6% are employed, while 32.4% are still looking for a job. The municipality has 35,651 economically inactive persons. Considering gender, there are 16.5% women less employed than men.

Table 10 Activity of the population between 15 years and more in 2002

Population activity		Municipality Bitola		Pelagonia Region		Republic of Macedonia	
		Number	Share	Number	Share	Number	Share
Economically active	All	43,278	54.8	104,016	53.3	824,824	52.6
	Employed	29,251	67.6	62,551	60.1	561,341	68.1
	Unemployed	14,027	32.4	41,465	39.9	263,483	31.9
Economically inactive		35,651	45.2	91,078	46.7	742,129	47.4
Activity rate		54.8		53.3		52.6	
Employment rate		37.1		32.1		35.8	
Unemployment rate		32.4		39.9		31.9	

Source: State Statistical Office, revised Census of population and households, 2005

The activity and employment rates in municipality Bitola in 2002 is bigger than the rates in the Pelagonia region and the country. In the following table is given a distribution of the economic activities in the municipality considering the number of active business subjects by sectors in 2013.

Table 11 Active business subjects by sectors in 2013

Sector	Municipality Bitola		Pelagonia Region		Republic of Macedonia	
	Number	Share	Number	Share	Number	Share
Agriculture, forestry and fishing	266	6.7	628	7.6	2,866	4.0
Mining and quarrying	8	0.2	22	0.3	164	0.2
Manufacturing	368	9.3	848	10.3	7,918	11.1
Electricity, gas, steam and air conditioning supply	6	0.2	7	0.1	132	0.2
Water supply, sewerage, waste management and remediation	12	0.3	29	0.4	306	0.4
Construction	169	4.3	328	4.0	4,322	6.1
Wholesale and retail trade; repair of motor vehicles	1,450	36.6	3,153	38.1	25,429	35.7
Transportation and storage	370	9.4	809	9.8	6,095	8.5
Accommodation and food service activities	245	6.2	498	6.0	4,482	6.3
Information and communication	69	1.7	107	1.3	1,446	2.0
Financial and insurance activities	15	0.4	24	0.3	390	0.5
Real estate activities	21	0.5	42	0.5	485	0.7
Professional, scientific and technical activities	309	7.8	546	6.6	5,817	8.2
Administrative and support service activities	90	2.3	147	1.8	1,514	2.1
Public administration and defense; compulsory social security	9	0.2	23	0.3	258	0.4
Education	55	1.4	118	1.4	1,025	1.4
Human health and social work activities	198	5.0	428	5.2	3,315	4.7
Arts, entertainment and recreation	80	2.0	133	1.6	1,179	1.7
Other service activities	217	5.5	378	4.6	4,147	5.8
<b>Total</b>	<b>3,957</b>	<b>100</b>	<b>8,268</b>	<b>100</b>	<b>71,290</b>	<b>100</b>

Source: State Statistical Office, MAKStat database 2013

According to State Statistical Office there were 3,957 active business subjects in municipality Bitola in 2013. The most important and dominant sectors are wholesale and trade with 36.6%, transportation and storage with 9.4%, manufacturing industry with 9.3% and professional, scientific and technical activities with 7.8%. From the other sectors, very important are agricultural sector together with forestry and fishing, as well as accommodation and food services.



## 2.3 General description of the project

### Present situation

The project assumes construction of streets with sidewalks, water supply system, storm water system and street lightening on the location of the former military barracks "Stiv Naumov". In the past sixty years, the land was used for special purposes of the army. The former area of the Army of the Republic of Macedonia (ARM), now represent a new settlement called "Zlaten Rid". Zlaten Rid is divided in three districts (ARM1, ARM 2 and ARM3). In accordance with the Law of Physical and Urban Planning, municipality Bitola prepared three Detail Urban Plans (DUPs) called: DUP for ARM district 1, DUP for ARM district 2 and DUP for ARM district 3.

Only two districts (ARM1 and ARM2) in the settlement "Zlaten Rid" are considered for construction at this phase and therefore the implementation of the project activities will be provided in this area. ARM1 has 327,400m<sup>2</sup> or 32.74ha land planned for construction of residential, commercial, cultural and educational buildings. Moreover, in ARM1 there are already existing buildings where some residents live and new buildings that are already constructed but not connected to the storm water and water supply systems. Also, in ARM1 there are located Faculty of Law, Faculty for business and administration and Biotechnical Faculty, local television station "Mega" and the training center for fire protection. ARM2 has 397,546m<sup>2</sup> or 39.75ha not constructed land planned for construction of individual houses. Located on urban public land, this area will represent the spirit of Bitola in the 21 century and will complement the old architecture in Bitola.

With the detail urban plans for ARM districts 1, 2 and 3 new opportunities are opened for development and investment components of Bitola. Municipality Bitola works on ensuring favorable infrastructure conditions of the area of former military barracks, which means ensuring availability of all underground installations and access to all residential and commercial buildings that will be built in this area.

Construction of new buildings in the settlement "Zlaten Rid" will represent every day needs of the residents who live and work in this area. According to the technical design the following buildings are planned for construction: primary and secondary school, kindergarten, fire station, oil station, police station, regional mail, two healthcare centers, three religious buildings, hotels with restaurants, townhouse, residential part - villas, viewing point, monument, sport center and spa center with mini pool, and other services in the form of laundries, bakeries, etc. Additionally, five administrative buildings with public enterprises, three big markets (malls), around ten restaurants, film city with studios, few sport fields with an aqua park, a museum of the history and significant personalities of Bitola, galactic observatory, dwellings with about 1,300 apartments, location of 184 individual households, ten bigger buildings with temporary housing, a new city center with a small square, small gym, location of several smaller banks, heating center for the entire complex, multiple locations for monumental purposes, three garages, fifteen substations and public parking spaces are also planned for construction. In ARM districts 1 and 2 the largest area is designed for housing, i.e. ARM district 1 for residential dwellings, while ARM district 2 for individual households.

In ARM1 are planned to live or work 15,686 residents or 356 residents per hectare. If the plan is realized in 60% in this district will live approximately 215 residents per hectare. In ARM1, in each parcel are predicted parking spaces to be built in accordance with the size of the building and the number of people that will live there. In the public parking places are designed 2,332 parking spaces and in the garages are designed additional 960 parking spaces or in total 3,292 public parking spaces. Considering the additional parking places in residential and commercial buildings, there will be 4,724 parking places in total.

In ARM2 are planned to live or work approximately 5,007 residents, or here will live approximately 150 residents per hectare. If the plan is realized in 60% in this district will live approximately 90 residents per hectare. For the thirteen blocks in this part of the district, parking spaces in each parcel are predicted to be built in accordance with the size of the building and the number of people that will live there. According to the technical design, there are 3,939 public parking places including 960 parking places in parking garages and together with the parking places in the residential and commercial buildings there are 5,667 parking places in total.

In more details, the project assumes construction of streets with sidewalks, water supply system, storm water

system and street lightening of three streets in ARM1 - SRU2, SRU3 and SRU4; construction of street with sidewalks, water supply system and storm water system of STU5b in ARM1 and construction of streets, water supply system, storm water system and street lightening of three streets in ARM2 - SRU4, STU7 and STU12.

At present, there is a poorly traced traffic network throughout the planning scope of ARM (all districts) that there is no way to be put in operation for the newly projected traffic demand. The same applies to paths that were used as already existing routes. The existing traffic network in the location has been built without prescribed profiles and without the required radiuses of horizontal and vertical curves, while all streets are planned for low speed driving. The existing streets do not meet the legal requirements which are a prerequisite for smooth and quality realization of the traffic. At the moment, the existing street infrastructure is in very bad condition or there are only adjusted service streets, as it is shown below.



Figure 3 Unpaved service street in ARM district 1  
Source: CeProSARD's archive<sup>2</sup>



Figure 4 Unpaved service street in ARM district 2  
Source: CeProSARD's archive

In terms of water supply on the location, there is a digital plan of the existing water supply system. The maintenance and the upgrading are in jurisdiction of the CSE "Vodovod"-Bitola. The existing water supply system is planned to be used in further development of project documentation as a supply pipeline for part of the settlement with special technical solutions or as an additional line for equalization of the pressure in the remaining system. The existing water supply system is fully used for the connectivity in ARM district 1, 2 and 3. Water supply system is carried out under the streets construction. With such approach, the construction of the water supply system on the planned streets will contribute to timely regulation of the water supply and will avoid damage to the streets after their construction.

In the planned scope covered by the DUP there is a collection channel for drainage the waste water towards the "5<sup>th</sup> channel". This channel collects the waste water from the buildings and storm water. This system was built to satisfy the needs of the previous buildings and people that stay in it. There is no technical documentation for the existing water supply system, but analysis show that there is a small parts of the existing storm water system with no capacity for connecting new buildings, and has inappropriate technical construction, quite shallow at some places with pipes profile that will not satisfy the need of the newly designed buildings.

Throughout the planned scope of the territory of ARM district 1, 2 and 3 passes the regulated basin of the River Kurderes, which is partly covered. According to the DUP of ARM the river basin stays unchanged, with eventually covering of some parts. The technical solution for placement of storm water system will contribute to solving the drainage of storm water from the newly constructed streets without causing contamination of the surface and underground waters in the area.

Municipality Bitola, in order to provide good power supply in ARM districts 1, 2 and 3, plans to use the existing routes of the transmission lines, that crosses near the cable for electricity supply from the transformer station "Bitola 4". The electricity supply will be made on the sidewalk part of the street "Partizanska" with the cable XJL-

<sup>2</sup> CeProSARD's team made an insight of the existing situation of the location on 23.12.2014

49-AI3h (1x150mm<sup>2</sup>) 10(20) kV. The power supply will be made with input and output in each of the transformer stations, without cutting the cable in the interspaces. Maximum two contiguous blocks will be supplied with electricity from one transformer station, which will be built with a size of 2x1,000kV. If newer types of transformer stations are placed, their size should be 2x1,200kV. In winter, the electrical energy is used for heating, so particular problems occur in the low voltage network. Some of the transformer stations 10/0.4 kV are loaded with 95% or more of the installed capacity. Therefore, in this area, the installed transformer stations will have greater capacity than the requirements of the settlement in order to avoid such problems in the system while using electricity in maximum capacity of the transformer stations. Also, a new connection with the transformer station "Bitola 3" will be made to the future transformer stations with new underground supply cables in order to provide safety electricity connection with each block separately. This will ensure good connection and power supply in the settlement. According to the existing situation, placement of street lightening is planned on three streets in ARM district 1: SRU2, SRU3 and SRU4, as well as on three streets in ARM district 2: SRU4, STU7 and STU12. This will contribute to safe communication and use of the streets by all of inhabitants in the new settlement.

The investment in the settlement "Zlaten Rid" is favorable due to its location near the city center, the developed infrastructure, the excellent accessibility and the favorable climate conditions. With the sale of the building lots in the area of the ARM district 1 and 2, the majority of the investors, after receiving the appropriate documentation from the competent authorities and construction permit, started with construction activities that should be finished in the period of 6 to 10 years (according to the country regulation). After they finish with the construction activities, the municipality is obligated to ensure appropriate infrastructure (streets, sidewalks, water supply system, sewerage and street lightening). At the same time, as previously mentioned, there are residents who already live in ARM1 in the existing buildings, which are connected to the old water supply and storm water systems. However, the existing water supply and storm water systems are very old, when there were former military barracks of Army of the Republic of Macedonia (ARM), and have not enough capacity to connect the new constructed buildings.

### **Future situation**

The total length of streets that are subject of this project is: 1,124.54m in ARM1 and 1,675.00m in ARM2, respectively the total length of streets projected for construction in the settlement "Zlaten Rid" is 2,799.54m. The project solution provides simultaneous placement of water supply system, storm water system, construction of streets and placement of street lighting. With such approach, the additional damage to the newly constructed streets and some partial solutions which will cause damage to the streets and sidewalks will be prevented.

One of the most important benefits of this project is the possibility for placement of new transport links in the area of the settlement "Zlaten Rid", which will significantly improve the traffic circulation in southern parts of the city Bitola (due to the fact that the area was closed during the stay of the army, all the traffic flows took place around the area of the settlement). The alignment of the streets is made in accordance with the General Urban Plan (GUP), i.e. in accordance with the Detailed Urban Plan (DUP) or the Law on Spatial and Urban Planning and follows the terrain configuration and spatial limitation of the area, and the available data on existing and planned infrastructure facilities. In figure 5 is presented the alignment of streets that are planned for construction in ARM district 1 and 2.

The traffic and transportation system of the city Bitola with the construction of the new streets in the new settlement will unite the older parts of the city (some of them with significant historical and architectural significance) and the new buildings, and will fulfill the requirements for achievement of functional modern transportation system. The regulation of the traffic will contribute to increase in the traffic safety and comfort, increase in the traffic capacity and communications, providing sense of security by pedestrians, improvement of the commercial activities, as well as continuation of the social and recreational activities for the residents who live in the southern parts of Bitola.

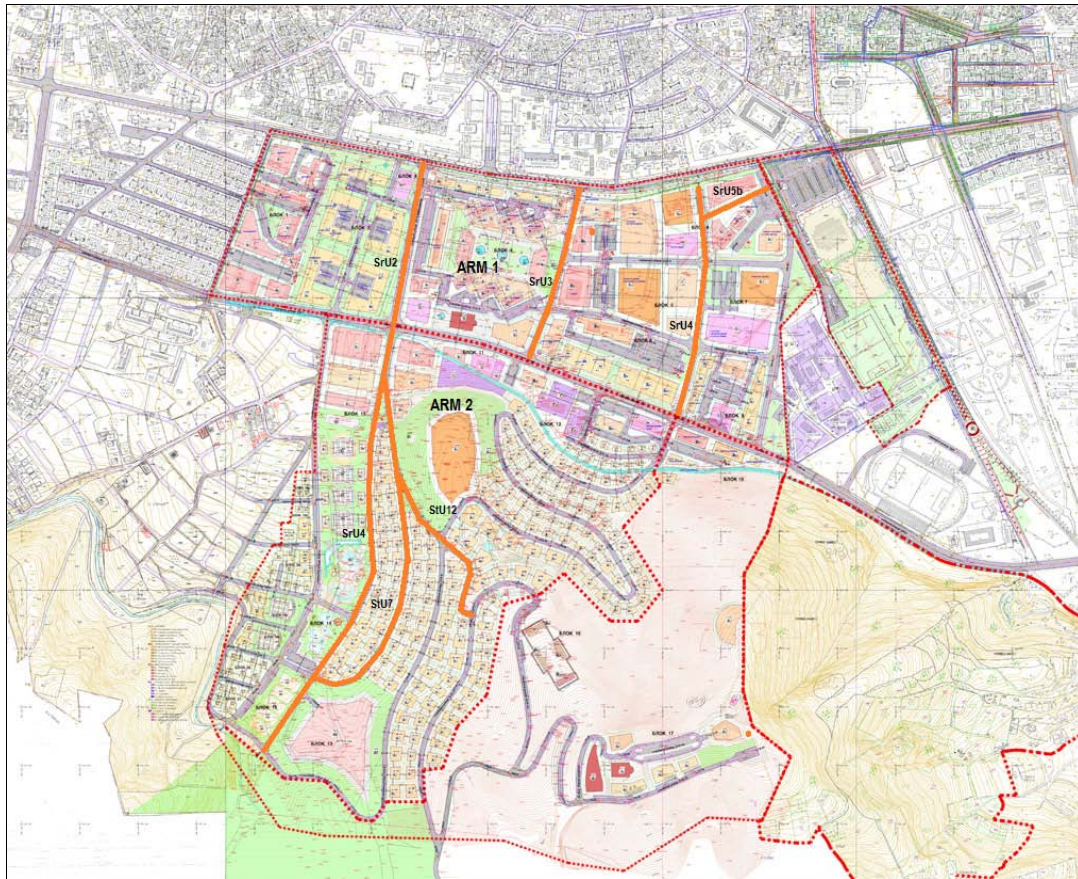


Figure 5 Alignment of the planned streets for construction in ARM district 1 and 2\*

\*Note: The streets that are subject to construction are marked with orange color

Source: Municipality Bitola GUP

Benefit from the implementation of the project activities is also the on time solution and placement of the water supply system, which supplies the entire area of the former military barracks with drinking water (ARM district 1, 2 and 3). The same water supply system is independent, with capped water source size form 8-12 liters per second. The water supply system of the whole area is planned to be connected with the city water supply system with new water pipelines with diameter no less than Ø200mm, with closed rings so called quarter. At later stage, for the construction of the other phases, a ring will be made with the urban blocks for quality and smooth supply of the area with water for personal and sanitation needs.

The technical documentation is in accordance with the laws and regulations in the area of design and urban planning, and the current standards for construction of streets, water supply system and storm water system and street lighting. The simultaneous construction of the storm water system will provide drainage of the storm water without flooding of the residential and commercial buildings during heavy rainfall and will reduce the damage to the constructed streets.

Placement of the street lighting on the streets will contribute to increased safety of the residents and the visitors. The construction of the area in the settlement "Zlaten Rid" should cause positive impacts and effects on the nearby surroundings due to better organization, infrastructure equipment and arrangement of the area. Also the construction of the area should be in line with the principals and regulations of sustainable development and environmental protection.

The implementation of the project is also expected to increase the property value of houses and other residential or commercial objects on the streets, thus increasing the growth of revenues from property taxes in the municipality. It is extremely important thorough and fast realization of the infrastructure project in every part of the new construction planned at the subject location.

## Strategic goals

The project is in line with the strategic documents of the municipality, such as the Strategy for Local Economic Development of Municipality Bitola for the period 2009-2014 and the new Municipality Development Plan 2015-2017 adopted earlier this year (<http://bitolskivesnik.mk/usvoeni-razvojni-planovi-vo-opshtinata-za-period-2015-2017-godina/>; <http://sn.mk/opstina-bitola/422-utvrdena-programata-do-2016>). According to the Strategy for Local Economic Development of Municipality Bitola for the period 2009-2014, a priority strategic objective of the municipality for the period 2010-2011 under no.5 is "Improvement of road infrastructure and transport services, as well as providing conditions for new investments", the activity 5.5 considers the area of the former military barracks, while for the period 2011-2012 the same strategic objective is given in no.4 and the activity 4.4 considers the area of the former military barracks. The municipality strategic development program for 2015-2017 is published in the Official Gazette of municipality Bitola no.14/2015. Moreover, conversion of the function of the old military barracks in few municipalities in the country, including municipality Bitola, is a strategic priority of the Government of the Republic of Macedonia. This is stated in the Governmental Working Program for the period 2011-2015 – Project "Old military barracks for new development" page 61 ([http://arhiva.vlada.mk/files/Programa\\_za\\_rabota\\_na\\_Vladata\\_na\\_Republika\\_Makedonija\\_za\\_periodot\\_2011-2015\\_godina.pdf](http://arhiva.vlada.mk/files/Programa_za_rabota_na_Vladata_na_Republika_Makedonija_za_periodot_2011-2015_godina.pdf)).

In order to provide access to every building lot in the new settlement "Zlaten Rid", construction of streets is required. The project provides construction of public streets with sidewalks, water supply system, storm water system and public lighting in ARM district 1 and 2. Also, the realization of this project enables complete arrangement of the area of former military barracks, with which functionally and ambient will complement with the infrastructural facilities in municipality Bitola. In ARM1 are planned to live or work 15,686 residents or 356 residents per hectare, while in ARM2 are planned to live or work approximately 5,007 residents or approximately 150 residents per hectare.

It is important to emphasize that the streets in the area of the settlement "Zlaten Rid" in terms of functionality represent an extension of the traffic flows in the city. Due to the existing situation in the city of Bitola there is an occurrence of discontinuity in the traffic flows, traffic jams and difficulties managing them. The improvement in the infrastructural network provides additional value to the project because the entire infrastructure (necessary for functioning of the planned areas for construction) will be conducted under the surface and sidewalks of the streets.

The implementation of a complex project such as the construction of streets in the new settlement "Zlaten Rid" with built water supply system, storm water system, sidewalks and street lighting will represent a contribution towards the development of the area, the local economy and implementation of planning documents in municipality Bitola. The activities that will be implemented at the intended location will provide opening of new jobs in activities provided with the planning contents (primary and secondary school, fire house, petrol station, kindergarten, police station, regional post office, two healthcare institutions, three religious buildings, city hotels with restaurants, city house, residential office, villa, sports and spa center with mini pool, services and other activities in form of laundries, bakeries, administrative buildings with state enterprises, three large stores (moles), a dozen restaurants, new urban center with small square etc.). The construction and realization of the planned contents will enable enhancement of economic, cultural, educational, health and other social functions with direct or indirect economic effects.

The proposed technical solution is in-line with the existing standards for this kind of projects and positive laws and regulations in the country. The municipality is obligated to ensure appropriate infrastructure (local roads, storm water system, water supply system, street lightening and electrification) to all settlements under its jurisdiction. This is regulated with the Law on Local Government (Official Gazette of the Republic of Macedonia 5/02) under the Article 22, List of competencies. At the same time, the project is part of the general urban plan (GUP) of municipality Bitola and DUP for ARM district 1, 2 and 3 and in accordance with the Law on Spatial and Urban Planning. It will contribute towards achieving the vision of the municipal administration for providing full coverage of transport and communal (utility) infrastructure throughout the municipal territory. The mayor and the municipal councilors strive to achieve full coverage of a transport, storm water and other communal (utility) infrastructure throughout the municipal territory.

This will undoubtedly contribute to improvement of the quality of life and the well-being of all residents of municipality Bitola. As explained previously, the implementation of the project will undoubtedly contribute to increased traffic safety and comfort, increase of the traffic capacity, providing sense of security by pedestrians, improvement of the commercial activities, as well as improvement of the outdoor social and recreational activities of the residents who live in the area.

### Knowledge and experience of the municipality Bitola

The knowledge and experience needed for successful implementation of the project are related to project management, technical knowledge and execution of procurement practices. Municipality Bitola - the competent authority in this project, has participated in a wide variety of large constructions or other type of projects with different investors, whereby the municipality provided the investors with technical services, and gained in return new businesses on its territory or improved housing facilities, schooling facilities, renewable energies and other social services. The municipality has implemented several projects for improving municipal services in cooperation with the local and international institutions and municipalities. The municipality has experience in managing different EU projects and cross border cooperation programs. It can be inferred that the municipality is able to contribute with the necessary experience to large construction projects such as the construction of storm water and water supply systems on the streets, as well as construction of streets and sidewalks in municipality Bitola envisaged to be financed from the World Bank MSIP funds to the Government of the Republic of Macedonia.

Table 12 Implemented infrastructure projects in the period of 2007-2014

#	Project manager - partner	Project name	Financing source	Implementation period	Budget (Euro)
1	Municipality Bitola - MTSP	Reconstruction of house for elderly people "Sju Rajder"	EU – IPA	2012-2014	672,000.00
2	Municipality Bitola – DETEPA, municipality enterprise for central heating – Aminteo – Municipality Novaci	Knowledge transfer from central heating in Bitola and Novaci – "Teleterm"	EU – IPA cross border program MK-GR	2011-2013	267,322.93
3	Municipality Bitola – Municipality Korca	Boundaries Without Borders	EU – IPA cross border program MK-AL	2011-2012	83,550.00
4	Municipality Bitola – DETEPA, municipality enterprise for central heating – Aminteo – TEI technological institute Kozani	Protection of the environment through the promotion of biomass for substitution of fossil fuels in heating and power generation - BIOFOSS	EU – IPA cross border program MK-GR	2013-2014	501,902.00
5	Municipality Bitola – Municipality Florina	Promotion of tourism and culture of municipality Bitola and Florina	EU – IPA cross border program MK-GR	2007-2008	250,000.00
6	Municipality Bitola	Revitalization of streets as part of the highway through the city of Bitola	EU	2007-2008	738,000.00
<b>Total</b>					<b>2,512,774.93</b>

Source: Municipality Bitola

## 2.4 Conclusions

The project is in line with the strategic priorities of the municipality Bitola and will contribute to achieving the vision of the municipal administration to ensure full coverage of transportation network, as well as water supply and storm water system in the municipality.

The relevance of the project results from the fact that most of the population is affected by the negative implications of inadequate local streets. The proposed technical solution is in accordance with the existing standards and regulations for this kind of projects. Knowledge and experience required for successful

implementation of projects on project management, technical knowledge and execution of procurement practices. Municipality Bitola has implemented a variety of similar projects in the past, in cooperation with international institutions and cross-border cooperation, which means that the municipality is able to carry out large construction projects such as construction of streets, storm water system, water supply system and street lightening.

3.



## SOCIAL IMPACT



### 3.1 Sociological study

This study is based upon the methodological concept of World Bank summarized as Five Entry Points, One Result. This concept requires exploration of five components: social diversity and gender, institutions, rules and behavior, stakeholders, participation and social risk. The assessment anticipated field research to get available information on interest and attitudes of stakeholders.

The research was based on meeting with a focus group with representatives from the local population and face to face interviews with the municipality representatives in order to give a social assessment about the project on construction of municipality streets with construction of sidewalks, water supply and storm water system and street lightening.

The interviews were organized with 7 officials from the municipality: mayor and 6 advisors from different political sides: 3 from ruling political party and 3 from the political parties in opposition. Between the interviewers there were 2 women (one from the ruling political party and the other from the political party in opposition). They all presented their opinions about the role and influence of various stakeholders in the process of decision making relevant to the project, as well as the level of information, capacities and readiness of the residents to support the project.

Taking their delegation and duties into account, the above mentioned officials proved to be useful interpreters of the opinions of the residents since being their representatives and having frequent meetings with them, they are very familiar with the needs, attitudes and opinions of the local population and the project. The answers from the interviews are very indicative and are a very good insight in the local processes to the project.

The focus group consisted of municipal residents who will be direct and indirect users of the streets considered by the project. Most of the participants were from the city of Bitola. There were 5 participants in the focus group from whom 1 woman and 1 student.

#### 3.1.1 Social diversity and gender

In the municipality Bitola, in the streets which are subject of this appraisal there are residents from different social groups (minorities, gender, language, people who work outside the country, vulnerable groups such as single mothers, students, etc.) By age groups are mainly young but also old people, some of them are people with a special needs and help. So far, in this area most of the residential houses are owned by young married couples and young people who were looking for their first place for living by their own. Especially, the nearness of the social and children care, educational and academic institutions make this area favorable for investments of the residential sector. In addition, the nearness of the city center makes also favorable condition for development of the businesses sector which influences opening new business subjects, such as development of small businesses and big city malls.

The prevailing nationality in municipality Bitola is Macedonian with 88.7%. From the other nationality the most represented are Albanians, Roma, Turks and Vlachos. Some of the young people are leaving the municipality, moving into the city of Skopje or in other countries, but most of them immigrate in the only one big city of the municipality, creating their own families in the city of Bitola. Residents who already live at the streets subject to this project are nearly equal considering male and female population. However, there are still a lot of residential houses and buildings to be build taking into consideration that the project assumes construction of streets in the location of the former military barracks "Stiv Naumov".

The main priorities of municipality Bitola is improving the quality of life of the residents, improving the infrastructure, reconstruction of the streets and new facilities for water supply, communal services, etc. According to both male and female population, the most important issues are development of industry and infrastructural projects due to the need for opening new jobs for young population. At the same time, both advisors of the community and local population added the construction of streets, water supply system and storm water system which are subject to this project as a priority because of the increased interest in development of the location as

a modern residential and business part of the city which will contribute to improve the living of all residents in the municipality.

Asked about the number of beneficiaries of the project, the interviewees expressed their opinion that all of the residents in the municipality will benefit of the project. More than 15,000 residents are expected to live and work in the location assumed by the project, especially young people. At the same time, residents from the other local communities within the municipality are expected to come every day on their work or to use social and administrative services which will be located in this area.

The construction of these streets will be beneficial for the safety walking of women with children, school children, elderly people and residents with special needs. Also, the development of new businesses will allow new employments.

### **3.1.2 Institutions, rules and behavior**

According to the interviewees' opinions the selected contractor must provide guarantees for the realization of the project. The municipal Council might request information from the mayor in reference to the project's realization any time. In addition, based on experience with other projects and the overall existing streets and storm water system in municipality Bitola, the municipal administration has the capacity to maintain the streets after the implementation of the project. In addition, the municipality has an administration, 149 employed, which has experience to monitor the progress of the project.

The municipality will be responsible for maintenance of the streets, and the CSE will continue with maintaining the streets in summer cleaning the sand and grass from the street and in the winter cleaning the street from snow. The local communities are not directly included in the maintenance, but they can contribute by request of the residents and municipality.

According to the interviews the private companies will have great benefits from the construction of the streets. The construction will provide easy access to all consumers, which will increase the earnings and trade services. This information was confirmed by the focus group participants, especially in the interest for opening new businesses from foreign investments.

### **3.1.3 Stakeholders**

There are several important stakeholders of the project. The interviewees fully agree that the most influential participant in the process of decisions making at the municipal level are the mayor and the municipal council. Residents, as an organized group of stakeholders, articulate their opinions directly to the council and the mayor, through the local communities present in the municipality and they can influence the decisions making process, as their opinions are always taken into consideration by the mayor and the council.

The interviewees stated that the project is supported by all councilors representing different political parties in the municipal council, which means that a political consensus is achieved on this issue and that the councilors are considering the project as one of the top priorities of the municipality Bitola. In respect of the residents, the opinion of most interviewees is that all of them support or will support the project, because it is in the general interest at the municipal level. Considering the meeting regarding the implementation of the project organized by the municipality on 27.11.2014, the project was considered as a top priority for the development of the municipality and the local population gives full support to realization of the infrastructural activities by using the funds of this project. The focus group participants confirm the need for construction of the streets, storm water system, water supply system and street lightening. The storm water system and water supply system were discussed as very important issue in order to prevent the flooding of the private houses of the residents who live and will live at these streets.

One very important question that was discussed is related to the potential "feeling of inequality among the residents and possibility they could endanger the realization of the project in order to get some personal or group benefits?" The interviewees and focus group participants stated that there is not risk or problems that can appear

during the implementation of this project because, like they stated it is for everyone's benefit and good. The overall interest of the local population is the project to be implemented and finished as much as possible due to the need for safety walking and crossing through this area.

### **3.1.4 Participation**

The residents have submitted their complaints about the current situation in the streets that are subject of this appraisal, which again implies that the residents are fully in favor of the project. They are well informed about this project by information through the local media, such as television, constant posting on the website of the municipality and local communities meetings and discussions with the residents, as well as by direct interview and discussions with the mayor in each settlement. Considering this, 25 local communities from the municipality Bitola already give written support for the implementation of the project activities, after the residents were full informed about the project purposes, characteristics and obligations. They can make their influence about the necessary changes if there is a need.

As elaborated earlier, since this project is expected to influence the overall living standard in the municipality, it is expected that all residents will support the project and even the environmental groups should be aware of the benefits from the project since the dust pollution will be much bigger if there are no asphalted streets in the area.

### **3.1.5 Social risks**

High social risk for carrying out the project cannot be perceived. In the municipality Bitola, the municipal council consists of 31 representatives from different political parties. Out of the total number of councilors 17 support the mayor, while 14 are in opposition. In spite of their political orientation, the councilors cannot endanger the realization of the project. As elaborated earlier, the councilors have already expressed their support for the project.

Interviewees presented a wide range of priorities in many fields that are within the local government competencies. They identified the construction of the infrastructure facilities, the local economic development, increasing the employment rate, construction of storm water and water supply system, improvement of social aid and social protection to vulnerable groups, etc. Without exceptions, all of the interviewees said that the one of the highest priority is full coverage of storm water and water supply system, throughout the municipality Bitola, while also the need of construction of the streets in the targeted area.

Additionally, it was discussed in detail whether the residents are fully informed of the intended reconstruction of the street that is subject to this appraisal. In that way, there is no risk for resident not to be informed about the construction of the streets. Here, should be mentioned that all residents were informed in details about the project activities through the media or local communities which give a written support for the project.

It is very important to state that the municipality has the intention to improve the transportation network in all local communities and to invest in storm water system wherever deemed necessary. It solves the problems that were persistent for many years. With the implementation of this strategically important project, the municipality is sending a strong signal that plans to solve this issue on the whole municipality area.

Since the streets are the subject of this appraisal, it is set on municipal (state) property; no expropriation is expected to be raised.

## **3.2 Other fields of considerations**

The construction of the streets in municipality Bitola which is subject to this appraisal is expected to improve the overall population living conditions in the municipality. The implementation of the project is expected to create savings in the item of the municipal budget for the streets maintenances on the long term basis, but also increase the revenues from selling parcels for residential and commercial purposes. The implementation of the project is also expected to improve local public finances in a sense that once the streets are constructed, the municipality will receive more revenues from taxes and reallocate them to other municipal services. Moreover, increased

property value as a result of the improved infrastructure will result in growth of revenues from property taxes.

For safe walking of children to school, there is an emergency need of sidewalks construction. For prevention of flooding of residential houses there is also a need for construction of storm water system. These project activities will bring welfare of the local population, but will also lower the costs for taking children to and from the school by car and possible repairs of the residential buildings due to the frequent flooding's.

### 3.3 Resettlement issues

The project is not a subject to resettlement issues because it involves construction of streets in the urban area of the municipality territory which is still not build. The parcels which are already sold or build are in accordance with the technical documentation. The construction of the streets will improve the transport and will allow development of new small businesses. Constructed infrastructure network will bring investments, especially from the migrated population in the foreign countries which is already a case considering the investments of the Macedonian immigrants in Australia. The increased number of businesses will open new jobs for the local population and contribute to the employment of young people. In that way, decreasing of the emigration is expected.

### 3.4 Conclusion on the project potential success and recommendation

The project is expected to be socially successful for the following reasons:

- The project is relevant because it is considered both cost-efficient and cost effective over a long run and also useful for the improvement of the community living in the municipality Bitola;
- The project is of a highest municipal priority for the public administration and for residents;
- The stakeholders are very motivated by the realization of the project;
- The project is not a subject to a resettlement issues;
- No expropriation issue is expected to be raised during the implementation of the project.

The main drivers of the change that will bring about prosperity are the municipal authorities (mayors, councilors, public enterprise managers) who have initiated and made the decision for seeking funding from the World Bank funded MSIP. Since the problem of bad infrastructure exists for many years it has been publicly declared and discussed on many occasions. Direct beneficiaries of the project are the residents in the city of Bitola who will live and work on selected streets (approximately 15,000 persons).

A part of the vulnerable and poor groups identified by the municipality (single mothers, disabled and elderly people), as well as kids and school children have special needs considering sidewalks and storm water system that will ease their movement. Gender balance needs to be incorporated in the strategic approach of the municipality and public communal enterprise towards all development efforts.

High social risks for carrying out this project cannot be perceived. There are no issues connected with ethnic distribution of population or inter-village rivalry: the action will allow benefits for all nationalities, it will cover the majority of residents in the municipality and there are no land ownership (expropriations and resettlements) concerns that need to be resolved.

# 4.



## ENVIRONMENTAL IMPACT

Bitola municipality is located in southwest part of the Republic of Macedonia and extends through the Pelagonia valley reaching the highest points of Baba Mountain. The City of Bitola, which is the second largest city in the country according to the number of inhabitants, presents administrative, cultural, industrial, commercial, and educational center of southwestern Macedonia.

According the general urban plan (GUP) for City of Bitola, the detailed urban plans (DUP) for ARM district 1 and ARM district 2 were developed and approved. These two districts are part of the newly projected settlement called "Zlaten Rid" and the development plans include: individual and residential buildings, cultural, education and healthcare facilities, administrative offices, hotels and restaurants, markets and other facilities. The Bitola municipality has responsibility to provide proper infrastructure such as construction of streets with sidewalks, water supply system, storm water system and street lighting for these two development district areas.

***The Project financed by the WB loan includes construction of 7 streets (service streets (SrU) and residential streets (StU) in districts as well as water supply system, storm water system and street lighting along the streets.***

The main types of activities during implementation of sub-projects in new settlement "Zlaten Rid" in City of Bitola is provided in the Table 13.

Table 13 Type of the sub - projects activities

Service street (SrU)/ Residential streets (StU)		Construction of street with sidewalks in total length (m)	Water supply system in total length (m) and different profiles	Storm water system in total length (m) and different profiles	Street lighting
ARM district 1	SrU2	283.44	271.04	540.40	X
	SrU3	309.68	296.30	256.00	X
	SrU4	405.02	408.12	377.70	X
	StU5b	126.40	137.80	118.00	X
Arm district 2	SrU4	805.00	1,650.00	805.00	X
	StU7	600.00	1,240.00	615.00	X
	StU12	270.00	590.00	270.00	X
<b>Total length (m)</b>		<b>2,799.54</b>	<b>1,703.26</b>	<b>2,982.10</b>	

In the past, the area was used by the army. There are some existing buildings in ARM district 1 (residential buildings, few buildings for faculties, local television station and training centre for fire protection), while ARM district 2 is still not urbanized.

#### **Current situation with infrastructure in new settlement "Zlaten Rid"**

The current infrastructure is in poor condition (District 1) and in some part (District 2) infrastructure does not exist at all. The existing streets are not asphalted, with improper radiuses of horizontal and vertical curves, without sidewalks and without street lighting. All this makes the streets unsafe for traffic and pedestrians. There is a need for construction of water supply systems and storm water system in both districts in order to fulfil the necessary water supply capacity.

The water supply system should provide sanitary water to the approx. 18,000 total consumers (permanent consumers, daily consumers and hotel guests) in volume of approx. 2M liters water /day to all buildings and facilities along the streets in both districts and the system will provide hydrant water from the city water supply system. The storm water system will collect the storm water from the buildings and the streets and it will

discharge it to the recipient – open channel where the River Kurderes has been regulated. The street lighting will be provided with sodium lights of 250W in accordance with EN standards related to street lighting.

### Location of the sub-projects

The new planned settlement "Zlaten Rid" is located in the southern part in City of Bitola. The boundaries of district 1 and district 2 are given in the Figure 6. The streets, which will be constructed with sidewalks, water supply system and storm water system are showed in Figure 6 (District 1 in the middle figure and District 2 at the right figure).



Figure 6 Location of boundaries of District 1 and 2 in Bitola and location of streets within two districts

### Main project activities with environmental impact

Each sub-project related to construction of streets with sidewalks, construction of water supply system, construction of storm water system and placement of street lighting includes different project activities, which are provided in the Main design for the particular sub-project, but mainly the activities could be divided in 3 phases: preparatory work, constructive phase and operational phase.

The preparatory phase is a short-term activity that consists of clearing the ground and removal of existing vegetation, removal of land area, excavation of excess soil, marking of construction sites, signing the sites and ensuring the implementation of OH&S standards (e.g., mobile toilets for workers and adequate containers for waste collection etc.).

The construction phase will include construction of 7 service and residential streets with sidewalks, construction of water supply system and storm water system and placement of street lighting along all 7 streets. The type of construction activities are presented in Table 14.

Operational phase will include the daily use of new streets, every day usage of water supply system for continues water consumption by the population and companies in both districts, proper storm water system for prevention of flooding and proper and appropriate street lighting for safe traffic and passing within the district areas. Within the operational phase, no significant adverse impacts are expected, but there will be major positive impacts to human health, environment and social life of citizens living there and general public within the districts.

Table 14 Description of sub project activities

Sub - project	Type of activity
Construction of streets with sidewalks	<ul style="list-style-type: none"> <li>-marking of the construction site,</li> <li>-excavations (removal of humus of the parts under the embankment,</li> <li>-compaction of the underground layers with mechanization, leveling and compaction of the sub base,</li> <li>-placing of a layer asphalt</li> <li>-making sidewalks from concrete tiles, placed on compacted ground of macadam</li> </ul>
Construction of water supply system	<ul style="list-style-type: none"> <li>-marking of the construction site</li> <li>-excavation of channel for installation of the water supply system (manual and mechanical)</li> <li>-installation of polyethylene water supply pipes and addition components</li> <li>-filling of the excavated channels with compaction</li> </ul>
Construction of storm water system	<ul style="list-style-type: none"> <li>- marking of the construction site</li> <li>-excavation of channel for installation of storm water system (manual and mechanical)</li> <li>-installation of polyethylene pipes and additional components</li> <li>-filling of the excavated channels with compaction</li> <li>-construction of manholes</li> </ul>
Placement of street lighting	<ul style="list-style-type: none"> <li>-marking of the construction site</li> <li>-excavation of channel for placing electric power cables</li> <li>-placing the electric power cables</li> <li>-making foundations for setting lamp posts for street lighting</li> <li>-Installation of water-resistant lighting armature for street lighting;</li> <li>-Installation of metal poles and street lights</li> </ul>

### Main environmental impacts and sensitive receptors

All project activities will be performed in urban area (settlement "Zlaten Rid", districts ARM 1 and ARM 2), in City of Bitola and near the very frequent main streets in Bitola.

There are many identified sensitive receptors that could be affected by construction works (including preparatory activities): a) within the settlement "Zlaten Rid" and all districts within the boundaries of the settlement, b) outside the boundaries of the settlement but still within the very urban part of City of Bitola. Currently, within the settlement "Zlaten Rid" there are citizens living in the existing and newly constructed buildings, students learning at the education facilities and workers who are engaged to work on construction of planned facilities in all districts within the settlement. Also, the workers who will implement the sub-projects activities will be also affected by the everyday works on the sites. It is very important to be mentioned that all sub-projects are complex and labor intensive tasks, so there is a possibility to have a large number of workers at the same time working on the sites. Outside the settlement, the local population, drivers passing on the main streets and boulevard located in the vicinity of the settlement will be the main sensitive receptors.

Taking into account the complexity of the sub-projects and location of sites, the **Traffic Management Plan (TMP)** should be developed prior start up of sub-projects activities. The TMP should include all necessary information and data related to proper transportation of workers, equipment, mechanization outside the settlement area, but also within the settlement and on micro level in the both districts. The scheme of the parking lots for the mechanization, temporary storage of construction material, in/out routes, vehicles speed limitation, horizontal and vertical signalization, etc. should be included as a minimum within the TMP. Special attention should be put on the signalization needed to be posted at the points where the construction vehicles will leave the construction areas and will enter the main streets and boulevard. The Information Boards need to be posted outside the settlement, but also within the two districts informing about the projects activities carrying out and attention signs.

The **Information note/Press releases** are also very important to be launched before starting the project activities and on regular basis within the sub-projects life. They need to be prepared by the Bitola municipality staff in close cooperation with the Contractor and they could be announced via municipality web page, municipality newspaper ("Bitolski Vesnik") and local television. The main aim of the Information notes/Press



releases are to ensure regular transportation of goods and people across the City of Bitola, to ensure smoothly implementation of all planned sub-projects activities, to prevent injuries and traffic congestion within the city and to inform just in time the local population about duration of project activities (start, timeframe and re-routes of traffic – if it is necessary). All of this is essential to minimize the negative impacts on the safety of workers, drivers of construction vehicles and heavy mechanization and the local population who lives near the construction sites and daily visits them (student from the education facilities).

The Contractor should implement all OH&S standards to prevent and minimize risks of workers' injuries, so the **OH&S Plan** should be developed before start up of workers. The OH&S Plan should include at least: usage of personal protective equipment by the workers at the construction sites, ensuring the appropriate changing and resting rooms provided for workers, appropriate notices and written guidelines for safety work with the equipment, safety movement and actions in emergency events, measures for first aid and fire protection, sufficient number of toilet facilities provided on site and their regular maintenance, preventive and mitigation measures applied against noise pollution and vibration and all other OH&S measures in order to ensure safety and health environment for the workers during construction works in order to avoid injuries and fatalities at works.

The Contractor should take care about the **community health and safety**, so proper fencing, marking the sites, lighting on nights the construction sites, posting the attention signs, regular cleaning the construction sites and their vicinity and other measures will ensure minimization of community risks of injuries or health problems and disturbances (especially noise and vibration).

During the construction activities, the **increased noise level** produced by construction machinery (trucks and excavators), which will be used for excavation of soil and supply of raw material (pipes, crushed stone material etc.) could be expected. The main receptors are workers and local population who lives near the construction sites. According to the Law on noise sensitive protection (Official Gazette No. 79/07, 124/10, 47/11 and 163/13) all project locations have been identified to the area with second degree of noise protection and the maximum allowed noise level should be 45dBA for night and 55dBA for evening and day.

Across the construction sites of ARM 1 and ARM 2 passes river Kurderes. Her basin is regulated in south part of district ARM 1. According the design and placement of the storm water system the project activities will not have adverse impact on the quality of river Kurderes. The waste water from construction activities, produced by workers should not emitted in the water recipient Kurderes without prior water treatment. The vicinity of the river should be taken into account due to potential **adverse impacts of the sub-projects to water quality** (improper waste management – disposal of waste streams along the river bank – channel).

**Air emissions** that may occur during the implementation of projects activities are from the phase of excavation of the soil, emissions from heavy construction machinery and emissions from vehicles in the phase of streets use. The proper dust management measures (e.g., cover of all vehicles carrying soil, washing the tires of the heavy vehicles, etc.) could reduce the PM (particulate matters – dust) emissions.

**Different waste streams** could be found on the construction sites due to the complexity of all sub-projects and materials that will be used. The **Waste Management Plan** should be developed as soon as the work starts. The good communication between the Contractor and the municipal staff at the beginning of the sub-projects is essential for the Contractor and Supervisor in order to get instructions where to dispose the waste streams. The primary selection of various waste streams is the most important step as well as the identification if the waste stream has hazardous or non-hazardous characteristics. This identification is important for further steps of proper collection, transportation and final disposal. The Contractor has to make classification of different type of waste according the national List of Waste and separate them. The following waste streams are possible streams that could be found on the sites within the settlement "Zlaten Rid" (Table 15):

Table 15 Possible waste streams generated on the construction sites

<b>13 - Oil wastes and waste of liquid fuels (except edible oils, and those in chapters 05, 12 and 19)</b>	
13 02	Waste engine, gear and lubricating oils
13 07 01*	Fuel oil and diesel
<b>15 - Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified</b>	
15 01	Packaging
15 01 01-15 01 09	Waste generated from paper and cardboard, wooden, plastic, metallic, glass, composite packaging
15 02	Absorbents, filter materials, wiping cloths and protective clothing
15 02 02*	Absorbents, filter materials, wiping cloths and protective clothing contaminated with dangerous substances
<b>16 - Waste not otherwise specified in the List</b>	
16 02	Wastes from electrical and electronic equipment
<b>17 - Construction and demolition wastes</b>	
17 01	Concrete, bricks, tiles and ceramics
17 02	Wood, glass and plastic
17 02 04*	Wood, glass and plastic containing or contaminated with dangerous substances
17 03	Asphalt, tar and tarred products
17 04	Metals (including their alloys)
17 05	Soil and dredging spoil
17 05 04	Soil and stones that do not contain dangerous substances
17 06	Insulation materials
17 07	Mixed construction and demolition waste
<b>20 - Municipal wastes and similar commercial, industrial and institutional wastes including separately collected fractions</b>	
20 01	Separately collected fractions (paper, glass, biodegradable waste from kitchen and canteen, solvents, paint, adhesives, medicines (there are also hazardous waste streams marks with *))
20 02	Garden and park waste (biodegradable, soil and stones)

The Contractor needs to keep records on generated waste streams). Keeping records of temporary and final disposal of waste is also important and it should be done on regular basis (type, quantity and waste management – temporary and final disposal, contracts with authorized collectors of waste, etc). Because of the vicinity of the river Kurderes, it is prohibited the temporary or finally disposal of waste streams near or in the river channel. The main responsibility for regular collection and management of municipal and inert waste lays on CSE “Komunalec” from Bitola, which performs collection, transport and final disposal of municipal waste on landfill “Meglenci” (located 16km northeast from City of Bitola). The different waste streams that could be generated are presented in Environmental Mitigation Plan. According the EIA Reports prepared for all project activities the estimated values for different waste streams are given in Table 16.

Table 16 Table with estimated values for generated different type of waste during project activities

No.	Name of sub-project	Type of waste		
		Waste from soil excavation/ construction waste from construction of streets with sidewalks (amount of waste in m <sup>3</sup> )	Waste from concrete/ excavation of soil during construction of storm water system (amount of waste in m <sup>3</sup> )	Waste from concrete / excavation of soil during construction of water supply system (amount of waste in m <sup>3</sup> )
<b>District ARM 1</b>				
1.	SRU 2	1.160,00	18,90	1,06
2.	SRU 3	967,95	27,68	1,00
3.	SRU 4	1.326,51	20,34	0,76
4.	STU 5b	308,06	4,06	/
<b>District ARM 2</b>				
5.	SRU 4	2.547,00	660,00	434,00
6.	STU 7	1.894,00	505,00	360,00
7.	STU 12	1.276,00	260,00	175,00

In broader surrounding of districts ARM 1 and ARM 2, the National Park "Pelister" (about 6-7 km southwest from project location) and the ancient city "Heraclea Lyncestis" (1.5-2 km south from project location) are located. National Park "Pelister" was declared in 1948 as a national park with 17150ha land area due to diverse and heterogenic flora and fauna. The unique Molika pine – Pinus peuce is the best known feature of National Park "Pelister". Molika is also found in other mountains of the Balkans, but one of the oldest and most compact forest communities can be found on Pelister. In spite of the fact that these protected areas are not close to the project location, the project activities will not have a negative impact on the biodiversity within the National Park "Pelister" or cultural heritage "Heraclea" (photos of the National Park and the ancient city are presented below).



In or near the sub-projects locations there are no registered endemic, protected and endangered animal or plant species or protected areas and habitats that will be negatively affected by the construction activities. There is no cultural heritage protected structures in the close vicinity or under the construction area.

**Within the operational phase**, the recommendation is to install the oil/water separators that will separate the oil content within the storm waters prior entering the River Kurderes. The oil/water separators should be installed at the end of storm water systems and should be regularly maintained and inspected. The accumulated waste from the oil separator should be identified as hazardous waste (waste code 13 05 02\* according the national legislation: Law on Waste and List of Waste codes – Official Gazette of RM no. 100/2005) and it should be

collected only in special hazardous waste canisters/tanks by the authorized waste collectors. The authorized collectors of hazardous waste could be found on the Ministry of Environment and Physical Planning website: [www.moepp.gov.mk](http://www.moepp.gov.mk).

For the new constructed drinking water supply systems, very important issue is the quality of drinking water coming from the water purification plant, so regular sampling and testing of drinking water are essential for minimization of human health risks.

The regular procurement of spare parts and sodium bulbs for street lighting, regular inspection and maintenance of the lights (cleaning) are very important for proper functioning of street lighting system.

Some of these environmental issues are included within the Environmental Impact Assessment Reports prepared for all construction sub-project activities in December 2012, by company "FORMI" from Bitola. The adoption of the Reports was performed by the Mayor of the City of Bitola, Mr. Vladimir Taleski. The Reports contain the main project goals, project activities, photos of the locations where the reconstruction activities will be performed and proposed general environmental mitigation measures.

The main responsibility for implementation of the purposed preventive and mitigation measures lies on the Contractor. The Supervisor and municipal staff need to monitor how the environmental and social related measures are implemented and how the purposed important parameters are monitored. The regular meetings among all involved are very important to discuss all issues that could appear in such complex sub-projects and to find proper solutions. ***It is a real complex project with cumulative environmental and social impacts (due to type of sub-projects, large number of workers included, location of the sub-projects, etc.), so often regular monitoring is needed and reporting to the Municipality of Bitola and MSIP Project Implementation Unit.***

In the following tables the detailed Environmental Mitigation Plan and Monitoring Plan for all sub-project activities are presented. The Contractor is obliged to follow the measures proposed within the EIA Reports as well as within the following tables in order to minimize the potential risks to the environment and human health and other social aspects.

Table 17 Environmental Mitigation Plan

Project activity	Potential impact	Impact scale	Proposed mitigation measures	Responsibility
<b>Construction of 7 streets with sidewalks, construction of water supply system, water storm system and Placing of street lighting the new settlement "Zlaten Rid" in City of Bitola</b>				
<p>Preparation activities before construction works start Marking out the route and construction of 7 streets, construction of water supply system, storm water system and placing of street lighting the new settlement "Zlaten Rid" in City of Bitola</p>	<p><b>Possible adverse social and health impacts to the population, drivers and workers due to:</b></p> <ul style="list-style-type: none"> <li>– Lack of ensured safety measures at the start of construction works</li> <li>– Injury passing near by the construction sites and open trench and manholes</li> <li>– Not compliance with strict OH&amp;S standards and work procedure</li> <li>– Inappropriate public access within the districts and within the settlement</li> </ul>	<p>Local/ within the new settlement "Zlaten Rid" and on micro level on District 1 and District 2 Short term during the construction period (different lengths – from 126.40m up to 805.00m for street and different lengths for water supply system and storm water systems) Significance - major</p>	<ul style="list-style-type: none"> <li>➤ Preparation and implementation of the Traffic Management Plan together with the municipal staff prior start up activities including traffic measures to be applied within the settlement border and outside the settlement: <ul style="list-style-type: none"> <li>• Identification of all public streets that will be affected and proposed for the transport routes during the construction period (which sections will be closed and till when, where the traffic will be diverted);</li> <li>• Training on safety driving of heavy equipment and building materials need to be delivered to the drivers from Contractor Company;</li> <li>• Workforce transportation should be considered within TMP;</li> <li>• Driving standards need to be proposed for driving on and around construction sites;</li> <li>• Limitation of the speed driving within the settlement and outside at the access streets to the urban part of City of Bitola;</li> </ul> </li> <li>➤ Announcement via municipal newspaper (Bitolski Vesnik), local TV station and municipality board/web page the information about the construction activities – start and finish of work for each day and location of activities, duration of work and traffic access on other streets;</li> <li>➤ Application of good construction practice and community safety measures including: <ul style="list-style-type: none"> <li>• Ensure the appropriate marking out the construction site /section by section along the streets;</li> <li>• Placement of horizontal and vertical signalisation and attention signs especially for limitation of speed driving near the streets under construction and surrounding streets and boulevard;</li> <li>• Warning tapes and signage need to be provided;</li> <li>• The streets and around sidewalks should be kept clean;</li> <li>• Installation of Notice board with general information about the project, Contractor and Supervisor at each street/sub-project;</li> <li>• Forbidden of entrance of unemployed persons within the warning tapes;</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Contractor –Bidder</li> <li>• Supervisor</li> <li>• Municipality staff (Communal Inspector and Environmental Inspector)</li> </ul>

Project activity	Potential impact	Impact scale	Proposed mitigation measures	Responsibility
			<ul style="list-style-type: none"> <li>• Constant presence of fire fighting devices should be ensured in case of fire or other damage;</li> <li>• Larger quantities of flammable liquids should not be kept on the site along the construction streets and sites within the settlement.</li> <li>➤ Development and implementation of OH&amp;S Plan including: <ul style="list-style-type: none"> <li>• Personal protective equipment for the workers at the construction sites should be distributed;</li> <li>• The appropriate changing, resting and dining facilities should be provided for workers as well as the lockers for personal belongs,</li> <li>• Appropriate notices and written guidelines for safety work with the equipment, safety movement and actions in emergency events should be prepared within the OH&amp;S Plan and distributed among the workers;</li> <li>• Measures for first aid and fire protection should applied on the sites (The training on first aid should be organized for the workers);</li> <li>• The first aid room should be ensured;</li> <li>• Transport and parking from/to construction sites need to be ensured;</li> <li>• Construction sites and object facilities will be guarded by guards 24 hours a day;</li> <li>• Sufficient number of toilet facilities need to be provided on sites and their regular maintenance should be organized;</li> <li>• Machines and heavy vehicles should be handled only by experienced and trained personnel;</li> <li>• All workers must be familiar with the fire hazards and fire protection measures and must be trained to handle fire extinguishers, hydrants and other devices used for extinguishing fires.</li> </ul> </li> </ul>	
	Possible impacts on landscape and visual aspects	Local/ within the settlement "Zlaten Rid" short term /minor	<ul style="list-style-type: none"> <li>• Good construction practices have to be implemented – including fencing and protection of construction sites according to national legislation;</li> <li>• Minimization of the construction area as much as possible (careful planning and designing of the project activities according to the Traffic Management Plan for a certain period of time);</li> <li>• Fully clean-up of the construction sites immediately after accomplishment of construction activities;</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor –Bidder</li> <li>• Supervisor</li> </ul>

Project activity	Potential impact	Impact scale	Proposed mitigation measures	Responsibility
			<ul style="list-style-type: none"> <li>Collection of the generated waste on daily basis, selection of waste, transportation and final disposal on appropriate places (according the type of waste – more details under Waste management issue).</li> <li>Dust generating activities should be avoid during periods of strong winds and rescheduled if it is possible.</li> </ul>	
	<b>Possible emissions by transportation vehicles and impact on air quality in the Municipality of Bitola due to:</b> <ul style="list-style-type: none"> <li>Gases emissions of dust-suspended particulates</li> <li>Traffic congestion will be caused as well causing changes in existing traffic circulation</li> </ul>	Local/ within the districts short term/ major	<ul style="list-style-type: none"> <li>Construction site, transportation routes and materials handling sites should be water-sprayed on dry and windy days;</li> <li>Construction materials should be stored in appropriate places covered to minimize dust;</li> <li>Vehicle loads likely to emit dust need to be covered;</li> <li>Engines of construction vehicles should be switched off when vehicles are not in use;</li> <li>Usage of protective masks for the workers if the dust appears;</li> <li>Restriction of the vehicle speed within the construction location;</li> <li>Perform regular maintenance of the vehicles and construction machinery in order to reduce the leakages of motor oils, emissions and dispersion of pollution;</li> <li>Burning of debris from ground clearance is not permitted.</li> </ul>	<ul style="list-style-type: none"> <li>Contractor –Bidder</li> <li>Supervisor</li> </ul>
	<b>Possible noise disturbance as a result of outdoor equipment usage and transportation vehicles driving around the sites</b>	Local/within the district 1 and district 2  short term /minor	<ul style="list-style-type: none"> <li>Whole noise protection area is residential and belong to the area with second degree of noise protection and the maximum allowed noise level should be 45dBA for night and 55dBA for evening and day;</li> <li>The control of noise level should be performed during work peaks in the vicinity of the educational faculty;</li> <li>The temporary noise protection barriers should be installed around the construction sites;</li> <li>The construction work should be not permitted during the nights, the operations on site shall be restricted to the hours 7.00 -19.00.</li> </ul>	<ul style="list-style-type: none"> <li>Contractor –Bidder</li> <li>Supervisor</li> </ul>
	<b>Possible impact on water courses – river Kurderes near the project site in City of Bitola</b>	Local/ short term/ minor due to the distance from the project site	<ul style="list-style-type: none"> <li>Minimize storage or disposal of substances harmful to water – river Kurderes (e.g. fuels for construction machinery) on the construction site;</li> <li>Organization of proper storage, handling and daily refilling the hazardous materials (fuels, additives, paints, etc);</li> </ul>	<ul style="list-style-type: none"> <li>Contractor –Bidder</li> <li>Supervisor</li> </ul>

Project activity	Potential impact	Impact scale	Proposed mitigation measures	Responsibility
			<ul style="list-style-type: none"> <li>The road should be kept clean and tidy to prevent the build-up of oil and dirt that may be washed into a water course or drain during heavy rainfall.</li> </ul>	
	<p>Possible adverse environmental impact and health effects could occur as a result of generation of the different waste streams</p> <p>The inappropriate waste management and not in time collection and transportation of waste streams</p>	<p>Local within the districts 1 and district 2</p> <p>short term/ major</p>	<ul style="list-style-type: none"> <li>Preparation and implementation of Waste Management Plan including;</li> <li>Identification of the different waste types at the reconstruction site (soil, sand, asphalt, bottles, food, etc.);</li> <li>Classification of waste according the national List of Waste (Official Gazette no.100/05);</li> <li>The main waste would be classified under the Waste Chapter 17 "Construction and demolition wastes (including excavated soil from contaminated sites)" with the waste code 17 01 – Waste from concrete, 17 05 04 – Excavated soil, 17 09 04 – Mixed waste from construction site and other waste streams proposed in Table 15;</li> <li>Small amount of solid municipal waste could be found (food, beverages), as well as packaging waste (paper, bottles, glass, etc.).</li> <li>Waste bins posted along the construction sites with different colours for different waste streams should be posted.</li> </ul>	<ul style="list-style-type: none"> <li>Contractor –Bidder</li> <li>Supervisor</li> </ul>
			<ul style="list-style-type: none"> <li>Collection, transportation and final disposal of the inert and municipal/communal waste by the PE "Komunalec" from Bitola;</li> <li>Possible hazardous waste (motor oils, vehicle fuels) should be collected separately and authorized collector and transporter should be sub-contracted to transport and finally dispose the hazardous waste;</li> <li>The materials should be covered during the transportation to avoid waste dispersion;</li> <li>Burning of construction waste should be prohibited.</li> </ul>	<ul style="list-style-type: none"> <li>Municipality staff (Communal Inspector)</li> <li>Mayor of the Municipality of Bitola</li> <li>CSE "Komunalec" from Bitola</li> </ul>
<b>Operational phase</b>				
<ul style="list-style-type: none"> <li><i>Regular cleaning of the separation tanks for the storm waters washed away along the streets is needed in order to prevent the overload with solid materials and flooding. The main responsibility is on the Municipality of Bitola in coordination with CSE "Komunalec" from Bitola. Regular inspection and maintenance of the streets, water supply and storm water systems and street lighting and storage of spare parts needed for replacement of failure parts (Development of Preventive and maintenance Plan).</i></li> <li><i>Regular checks on supply water quality in accordance with the Plan for water testing performed by the Public Health Institute – Bitola.</i></li> <li><i>Positive impacts are expected from the construction of water supply system through supplying the local population with safety and clean drinking water. Construction of streets with sidewalks and street lighting will have positive impact in terms to provide a traffic link with the settlement "Zlaten Rid" and Bitola City and will ensure safe traffic.</i></li> </ul>				



Table 18 Environmental Monitoring Plan

What parameter to be monitored?	Where is the parameter to be monitored?	How is the parameter monitored?	When is the parameter monitored (frequency of measurement)?	Why is the parameter monitored?	Cost		Responsibility	
					Construction	Operations	Construction of 7 streets with sidewalks, construction of water supply system, water storm system and placing the street lighting the new settlement "Zlaten Rid" in Bitola municipality	Operation of 7 streets with sidewalks, water supply system and water storm system and street lighting
Project stage: Preparation activities/ Startup of the construction work (site cleanup, and marking out the route and construction sites along the districts)								
The safety protection measures applied for the workers and proper implementation of OH&S Plan Community safety measures applied	On the construction sites	Visual checks	During the clean-up and preparatory works At the beginning of each working day during the sub-projects activities	To prevent health and safety risks – mechanical injuries To be in compliance with national communal health regulation and OH&S standards			Contractor - Bidder Supervisor Communal Inspector at the Municipality of Bitola	
Project stage: Construction of 7 streets with sidewalks, construction of water supply system, water storm system and Placing of street lighting the new settlement "Zlaten Rid" in Bitola municipality								
Safety traffic flow through the district 1 and district 2 in new settlement "Zlaten Rid" and in surrounding area Proper implementation of Traffic Management Plan	On the site	Visual monitoring and check the Traffic Management Plan	During the working day	To ensure the coordinated traffic flow through the district 1 and district 2 in new settlement "Zlaten Rid"			Contractor - Bidder Supervisor Communal Inspector at the Bitola municipality	
Proper implementation of Waste Management Plan	On the site	Review the keeping records on generated and managed waste streams as well as the Contracts for waste collection	Prior start up activities and during daily working period	To ensure proper waste management and minimization of pollution risks			Contractor - Bidder Supervisor Communal Inspector at the Bitola municipality	
Any disposal of the waste streams (solid and liquid) near the river Kurderes as potential pollution of good ecological status of water course	In settlement "Zlaten Rid" near the project areas	Visual check if the waste is disposed near the Kurderes river	During the construction period (once per week)	To ensure good status of water quality			Contractor - Bidder Supervisor	
Primary selection of the	On the sites	Review the	At the beginning of	To separate hazardous from			Contractor – Bidder	

What parameter to be monitored?	Where is the parameter to be monitored?	How is the parameter monitored?	When is the parameter monitored (frequency of measurement)?	Why is the parameter monitored?	Cost		Responsibility	
					Construction	Operations	Construction of 7 streets with sidewalks, construction of water supply system, water storm system and placing the street lighting the new settlement "Zlaten Rid" in Bitola municipality	Operation of 7 streets with sidewalks, water supply system and water storm system and street lighting
waste streams as they are generated at the spots		documentation	work with new material/s	the non-hazardous waste as well as inert from biodegradable waste			Supervisor	
Collection and transport as well storage of hazardous waste (if any occurs)	On safety temporary storage	Review the transportation list and conditions at the storage facility	Before the transportation of the hazardous waste (if there is any)	To improve the waste management practice on municipality and national level/ Not to dispose the hazardous waste on the waste disposal spots			Authorized Contractor for collection and transportation of hazardous waste (if any occurs)	
Collection transportation and final disposal of the municipal and inert solid waste	On the sites and around the sites	Visual monitoring and reviewing the transportation and disposal lists from the sub-contractor	After the collection and transportation of the solid waste on regular base each day	Not to leave the waste on the spot to avoid the environmental and health impact on residents To have the real data for generated waste streams and to improve the waste management			Contractor – Bidder Supervisor	
Fulfilled Annual Report for collection, transportation and disposal of waste	Local self-government administration	Review of documentation – Identification of waste list	After the accomplishment the task of collection, transportation, temporary disposal and final disposal of waste	To improve the waste management on local and national level To be in compliance with national legal requirements			Mayor of Bitola municipality/ Ministry of Environment and Physical Planning	
Temporary noise protection barriers installed around the educational facilities	Around the educational facilities	Visual check	Before the construction work start at the site near the educational facilities	To minimize the noise disturbance of the sensitive group of people			Supervisor/ Communal inspector	
Noise measurements	On the sites	Monitoring of the noise levels	During the work peaks	To ensure noise level limits according regulation			Contractor - Bidder	

What parameter to be monitored?	Where is the parameter to be monitored?	How is the parameter monitored?	When is the parameter monitored (frequency of measurement)?	Why is the parameter monitored?	Cost		Responsibility	
					Construction	Operations	Construction of 7 streets with sidewalks, construction of water supply system, water storm system and placing the street lighting the new settlement "Zlaten Rid" in Bitola municipality	Operation of 7 streets with sidewalks, water supply system and water storm system and street lighting
		dB (A) with appropriate monitoring devices						
<b>Operational phase</b>								
Drinking water quality	Before the water distribution through the water supply network  The water sample should be analysed by the Authorized laboratory (Public Health Institute – Bitola)	Laboratory equipment for physical-chemical and microbiological water quality analysis	Continuously according the Plan for drinking water quality analysis (short-medium and long water quality analysis) especially the surplus of the residual chlorine	To ensure the distribution of high quality drinking water to the population minimizing the health risks of waterborne diseases				Mayor /Director of Public Health Institute - Bitola
Preparation of the Preventive and maintenance Plan including all sub-projects  Regular maintenance of the streets, water supply network, storm water system and street lighting	Along the 7 streets within the District 1 and District 2	Review of the Preventive and maintenance Plan and proposed measures for proper operation of all constructed elements	Regularly on 6 months within the operational phase	To prevent or minimize the risks to human health as a result of water borne diseases, environmental pollution (chemicals, heavy metals, etc), proper operation of the traffic and minimization of traffic accidents				Mayor /Director of CSE "Komunalec" from Bitola and CSE responsible for maintenance of roads and streets
Clean up of the oil/water separators at the end of storm water system along the streets	At the storm water separation tanks location	Visual check	On regular basis and especially after hard rain	To ensure that the separators are clean from disposed solid materials coming from storm waters washing on the streets				Technical staff in the CSE "Komunalec"



# 5.

## TECHNICAL SOLUTION

## 5.1 Description

The project includes technical solution for complete construction of 7 streets in the newly designed settlement "Zlaten Rid" on the territory of the former military barracks "Stiv Naumov" in municipality Bitola. The project assumes also financing the supervision. The project provides construction of public streets on the secondary network of streets, which consists of service streets (SrU) and residential streets (StU). In ARM district 1, which is intended for collective residential housing, the streets are named as: SrU2, SrU3, SrU4 and StU5b. ARM district 2 is intended for individual housing and the streets are named as: SrU4, StU7 and StU12. The construction of the streets includes:

- Construction of streets, water supply system, storm water system and sidewalks and street lighting in ARM district 1 on streets SrU2, SrU3 and SrU4;
- Construction of streets, water supply system, storm water system and sidewalks on street StU5b in ARM district 1 and
- Construction of streets, water supply system, storm water system, and street lighting on streets SrU4, StU7 and StU12 in ARM district 2.

According to the General Urban Plan (GUP) of 1999, the roads of the city Bitola are classified as: arterial streets, collection streets and local streets (service, residential, access streets, etc.). The streets that are subject to construction are classified as service streets (SrU) and residential streets (StU). The plan for the project has been prepared in accordance with the General Urban Plan (GUP), follows the terrain configuration and spatial limitation of the area and the available data on existing and planned infrastructure facilities. The technical documentation is in accordance with the laws and regulations in the areas of design, urban planning and the applicable standards for construction of streets with sidewalks, water supply system, storm water system and street lightning. In the following figures is shown the situation plan of ARM district 1 and ARM district 2 separately with the streets (marked with orange color) that are subject to this Appraisal.



Figure 7 Streets in ARM district 1  
Source: Technical design of ARM 1



Figure 8 Streets in ARM district 2  
Source: Technical design of ARM 2

## 5.2 Analysis

The technical documentation for the preparation of infrastructural projects for construction of streets, which are classified as service streets (SrU) and residential streets (StU), is subject to the Detailed Urban Plan (DUP) for ARM district 1 and 2 which are made according to the General Urban Plan (GUP) of the city Bitola. The documentation of the infrastructural project for construction of streets (SrU2, SrU3, SrU4 and StU5b) with sidewalks in ARM district 1 is prepared by "Proing" DOOEL from Bitola. The project for the water supply system and the storm water system are also prepared by the same company. The technical documentation of the infrastructural project for construction of streets (SrU4, StU7 and StU12) with sidewalks in ARM district 2 is

prepared by "Bidat plus" DOOEL from Kavadarci, as well as the project for the water supply system and storm water system. The projects for the street lighting in ARM district 1 and 2 are prepared by "Formi" DOOEL from Bitola.

The project documentation is prepared on the basis of previously performed geo-mechanical and geotechnical analysis on the terrain by the company "Evro Konsalting" DOO from Skopje. The structure, the size and the proposed technical solutions of the streets are based on the current legislation, regulations and standards applicable to this type of traffic.

The total length of streets projected for construction in the area of the settlement "Zlaten Rid" is 2,799.54m. The following table provides the projected length and activities for construction of the infrastructural network:

Table 19 Technical characteristic of the streets provided for construction

#	Street	District	Description of activities	Length (m)
1	"SrU 2"	ARM 1	Construction of streets, water supply system, storm water system and street lighting	283.44
2	"SrU 3"	ARM 1	Construction of streets, water supply system, storm water system and street lighting	309.68
3	"SrU 4"	ARM 1	Construction of streets, water supply system, storm water system and street lighting	405.02
4	"StU 5b"	ARM 1	Construction of streets, water supply system and storm water system	126.40
5	"SrU 4"	ARM 2	Construction of streets, water supply system, storm water system and street lighting	805.00
6	"StU 7"	ARM 2	Construction of streets, water supply system, storm water system and street lighting	600.00
7	"StU 12"	ARM 2	Construction of streets, water supply system, storm water system and street lighting	270.00
<b>Total</b>				<b>2,799.54</b>

Source: Project documentation

The construction of streets will include various construction works for construction of streets with sidewalks, water supply system, storm water system and street lighting, including:

a. Construction of water supply system:

- Marking and securing of the alignment of the channel for setting the water supply system – the operation includes marking the channel, geodetic measurements regarding the transfer of data from the project to the location or from the location to the drawings and maintaining the marks of the location during the construction;
- Excavation of channel for setting of the water supply system, mechanically 80% and manually 20%;
- Setting sand along the channel width 60cm and 10cm thick by setting slope which is projected in the longitudinal profiles;
- Setting and installation of polyethylene water supply pipes along with the necessary parts and materials for connecting with a working pressure of 10 bars;
- The filling of the excavated channels is performed with compaction in layers from 20 to 30cm;
- Installation of firefighting and park hydrants.

b. Construction of storm water system:

- Marking and ensuring of the alignment of the channel;
- Excavation of channel for setting the storm water system, mechanically and manually;
- Setting sand along the channel width 60cm and 10cm thick by setting slope which is projected in the longitudinal profiles;
- Setting and installation of polyethylene pipes along with the necessary parts and material for connecting;

- The filling of the excavated channels is performed with compaction in layers from 20 to 30cm;
  - Construction of manholes.
- c. Construction of streets with sidewalks:
- Marking and ensuring of the alignment – the operation includes marking of the alignment, geodetic measurements regarding the transfer of data from the project to the location or from the location to the drawings and keeping the marks of the location throughout the period of construction;
  - Excavations for making the underground (removal of humus of the parts under the embankment, compaction of the underground layers performed with mechanization for compacting according to the type of the underground layers), making embankments, leveling and compaction of the base;
  - Excavations for the upper part of the street which includes making of the buffer;
  - Paving the upper part of the street construction in accordance with the project documentation;
  - Making sidewalks from concrete tiles, placed on compacted ground of macadam.
- d. Setting public lighting:
- Marking and ensuring the alignment;
  - Excavation of channel for setting electric power cables with average depth of 0.8m and a width of 0.4m;
  - Setting fine sand along the channel with thickness 10cm;
  - Setting and installation of protective tubes for placement of the electric power cables and communication cables;
  - The filling of the excavated channel is performed with compaction in layers from 20 to 30cm;
  - Protection of the ends of the tubes with PVC cover and foil;
  - Construction of foundations for setting lampposts for street lighting in accordance with the project documentation;
  - Installation of water-resistant lighting armature for street lighting;
  - Installation of metal poles and street lights in accordance with the project documentation.

### 5.2.1 Construction of streets in ARM district 1

The total length of streets which are subject to construction in ARM district 1 is 1,124.54m. The goal is to build an infrastructural network of streets with fully set water supply system, storm water system and street lighting. In this district, the street lighting along the route of the residential street StU5b will be financed with funds that will be additionally provided by the municipality.

For dimensioning of the streets that belong to ARM district 1 and which are subject of this Appraisal, are used previously developed documents: DUP "ARM district 1" – Bitola, Infrastructural project for roadway and communal installations prepared by "Proing" – Bitola with technical number 44/2021 from September 2012, an updated geodetic base in scale 1:1000. Due to the construction of new alignments of the streets, a geo-mechanical elaborate is prepared for the subject location by "Evro Konsalting" – Skopje with technical number 180-05/12.

#### a. Service street "SrU2"

The location for the construction of the street "SrU2" is in the central part of ARM district 1 and it represents direct connection between the street "Partizanska" and the main service street "SrU1". The street is also known as "Mal Bulevar". The terrain on which the construction of this street is planned is very flat with small slopes from south towards north and from west towards east. The area is partly built. This part of the area has also been used as a street in the former military barracks "Stiv Naumov". Figure 8 shows the current condition of the street.



Figure 9 Current condition of the street SrU2 in ARM district 1  
Source: CeProSARD's archive

The length of the street "SrU2" is 283.44m. It is planned with two street lanes, each with a width of 7m. The street lanes will be separated between with greenery with width 1m and sidewalks on both sides with a variable width of 1.5 to 3.0m, as it is shown in Figure 10.

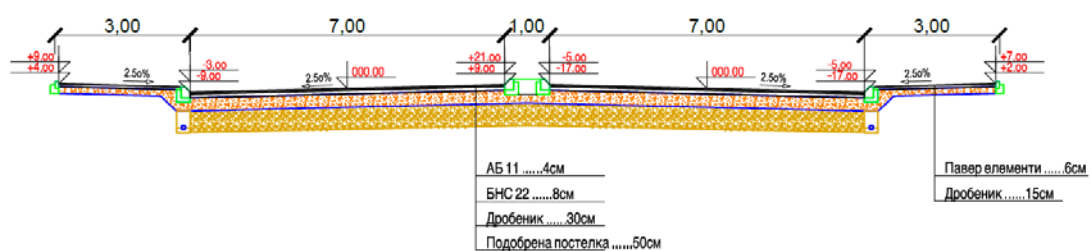


Figure 10 Typical normal profile of street SrU2  
Source: Project for street construction infrastructural installations for street network in ARM district 1 in Bitola – service street "SrU2"

The construction of the street "SrU2" will be performed on the following way:

- Wearing Course AB11 (Asphalt concrete layer).....4cm
- Bearing Course BNS22.....8cm
- Street base crushed stone layer.....30cm
- Sub-base Course.....50cm

The sidewalks will be made with interlock concrete tiles placed crushed stone base layer with the following sizes:

- Interlock concrete tiles.....6cm
- Fine sand made of crushed stone material.....5cm
- Crushed stone base layer.....15cm

The maximal applied longitudinal slope of the vertical alignment along the street "SrU2" is 3.687% and the minimal is 0.892%. The cross section profile of, the street is designed with a cross slope of 2.5%, and the slope of the sidewalks is 2.5% in direction towards the streets. The storm water is planned to be collected through



street gullies. The drainage of the sub-base course is planned to be carried out through its cross slope which is minimum 4% and through drainage performed along the street.

**b. Service street "SrU3"**

The location of the street "SrU3" is in the central part of ARM district 1 and it represents direct connection between the street "Partizanska" and the main service street "SrU1". The terrain on which the construction of this street is planned is flat and partly built. This part of the area has also been used as a street in the former military barracks "Stiv Naumov". Figure 11 shows the current condition of the street.



Figure 11 Current condition of the street SrU3 in ARM district 1  
Source: CeProSARD's archive

The length of the street "SrU3" is 309.68m. The street is planned with two street lanes 4.5m wide in total the roadway is designed with a width of 9m and with sidewalks on both sides of the street 2.5m wide and the carriageway profile of the street is 14m wide with additional extensions of the sidewalks where is applicable as it is shown in the following figure.

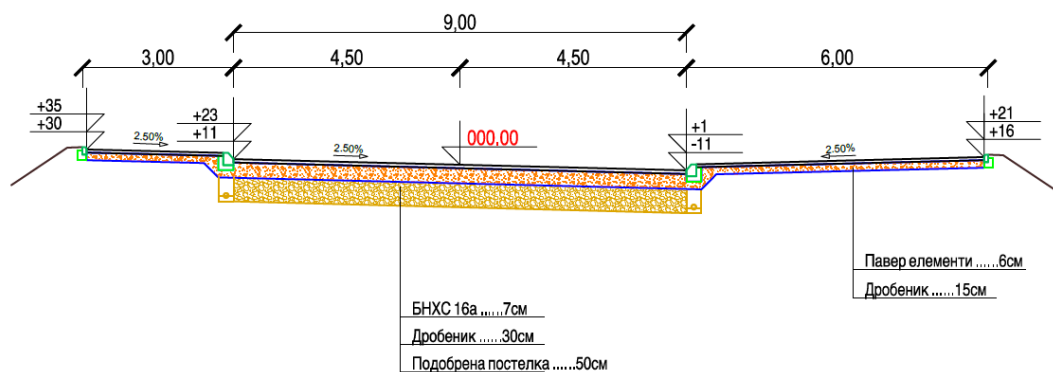


Figure 12 Typical normal profile of street SrU3

Source: Project for street construction infrastructural installations for street network in ARM district 1 in Bitola – service street "SrU3"

The construction of the street "SrU3" will be performed on the following way:

- Bearing and Wearing Course BNHS16a.....7cm
- Street base crushed stone layer.....30cm
- Sub-base Course.....50cm

The sidewalks will be made with interlock concrete tiles placed over the crushed stone base layer, and thick layer

of fine sand. The sidewalks cross profile is with the following dimension of the embedded layers:

- Interlock concrete tiles.....6cm
- Fine sand made of crushed stone material.....5cm
- Crushed stone base layer.....15cm

The maximal applied longitudinal slope of the vertical alignment along the street “SrU3” is 3.687% and the smallest 0.892%. In cross-sectional view, the street is designed with a cross slope of 2.5% and the slope of the sidewalks is 2.5% in direction towards the streets. This type of construction of the slope allows natural flow of the storm water and its easier collecting and drainage in to the storm water system. The storm water is planned to be collected through street gullies. The drainage of the sub-base course is planned to be carried out through its cross slope which is minimum 4% and through the drainage system installed along the street.

**c. Service street “SrU4”**

The location of the street “SrU4” is in ARM district 1 and it is not planned to be exposed to heavy traffic loads. Figure 12 shows the current condition of the street.

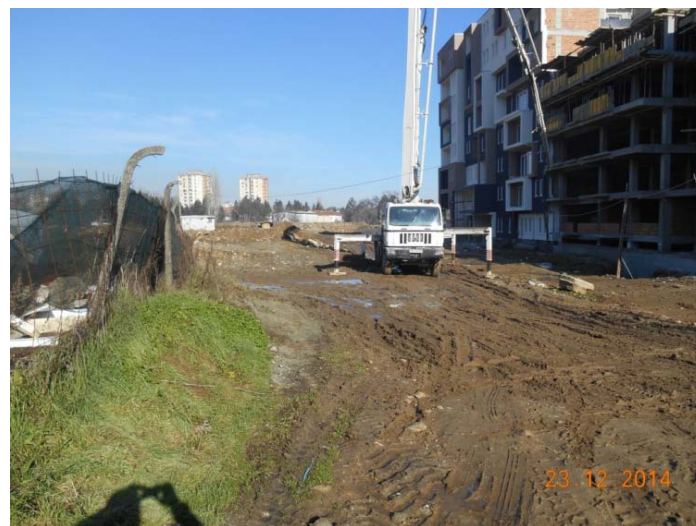
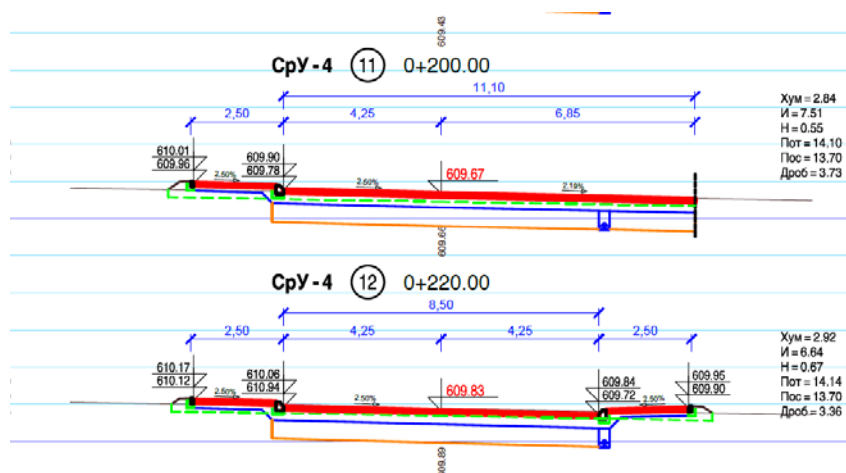


Figure 13 Current condition of the street SrU4 in ARM district 1  
Source: CeProSARD's archive

The length of the street “SrU4” is 405.02m. The roadway of the street is with variable width of 8.5 – 13.5m on some places where the extensions are to be used as parking areas. The normal cross profile of the carriageway is 13.5m wide consist of two roadway lanes of 4.25m and 2.5m wide two-sided sidewalks in accordance with the prevailing DUP.



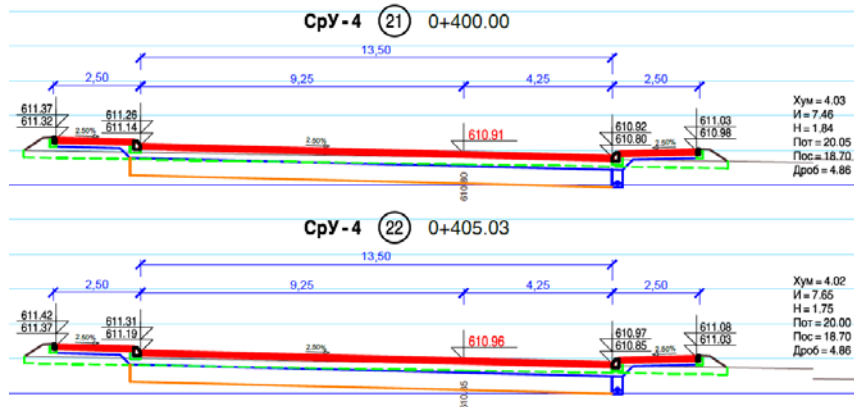


Figure 14 Transverse profiles of the residential street "SrU4"  
 Source: Basic project for linear infrastructural construction in ARM district 1, Book 2

The construction of the street "SrU4" will be performed on the following way:

- Bearing and Wearing Course BNHS16a.....7cm
- Street base crushed stone layer.....30cm
- Sub-base Course.....50cm

The sidewalks will be made with interlock concrete tiles placed crushed stone base layer with the following dimensions:

- Interlock concrete tiles.....6cm
- Fine sand made of crushed stone material.....5cm
- Crushed stone base layer.....15cm

**d. Residential street "StU 5b"**

The location of the street "StU 5b" is in ARM district 1 and it is not planned to be exposed on heavy traffic loads. The length of the street "StU 5b" is 126.4m. The street is planned to be made with two roadway lanes with variable wide of 6-10m depending on the field conditions and sidewalks on both sides of the street with a wide of 2m as it is shown on the following figure.

The construction of the street "StU 5b" will be performed on the following way:

- Bearing and Wearing Course BNHS16a.....7cm
- Street base crushed stone layer.....30cm
- Sub-base Course.....50cm

The sidewalks will be made with interlock concrete tiles placed crushed stone base layer with the following dimensions:

- Interlock concrete tiles.....6cm
- Fine sand made of crushed stone material.....5cm
- Crushed stone base layer.....15cm

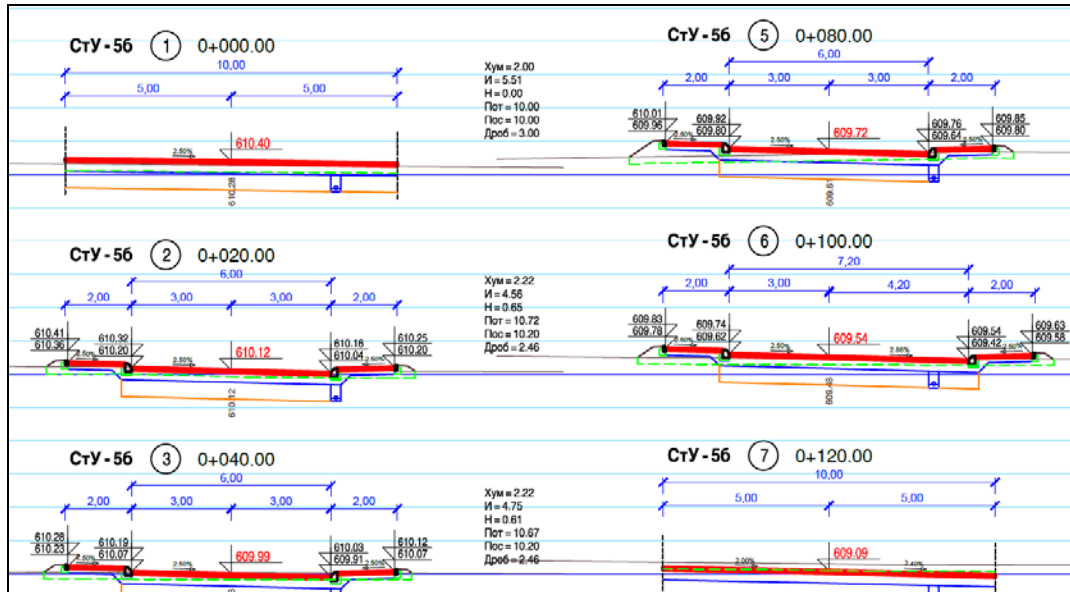


Figure 15 Transverse profiles of the residential street "StU 5b"  
 Source: Basic project for linear infrastructural construction in ARM district 1 - Book 2

### 5.2.2 Construction of streets in ARM district 2

The total length of streets which are subject to construction in ARM district 2 is 1,675m. The goal is to build an infrastructural network of street with fully set water supply system, storm water system and street lighting.

For dimensioning of the streets that belong to ARM district 2 and which are subject of this Appraisal, are used previously developed documents: DUP "ARM district 2" – Bitola, Infrastructural project for roadway and communal installations prepared by "Formi DOOEL" – Bitola with technical number 44/2021 from April 2013, an updated geodetic base in scale 1:1000. The documentation is prepared in accordance with relevant legal requirements.

#### a. Service street "SrU4"

The location of the street "SrU4" is in ARM district 2 and begins from the street "SrU1". The terrain is mostly stable, healthy, with no visible signs of existing landslides and landslides that could possibly arise. The total length of the street is 803.82m. Figure 16 shows the current condition of the street.



Figure 16 Current condition of the street SrU 4 in ARM district 2  
 Source: CeProSARD's archive

The street is planned to be constructed with two roadway lanes 2x3.5wide with variable width of the roadway 7 – 12m of which from chainage km 0+00 up to chainage km0+110 is with 12m wide roadway and this part of the street is an access to ARM district2 that further divides in two streets SRU4 and STU7. The design includes sidewalks on both sides of the street with a width of 1.5 to 3m. The cross slope of the street has been adopted as one-sided along the entire length and is 2.5%. This type of construction of the slope allows natural flow of the storm water and its easier collecting and drainage in to the storm water system.

The construction of the street “SrU4” will be performed on the following way:

- Wearing Course AB11 (Asphalt concrete layer).....5cm
- Bearing Course BNS22.....7cm
- Street base crushed stone layer.....30cm

The sidewalks will be made with interlock concrete tiles placed crushed stone base layer with the following dimensions:

- Interlock concrete tiles.....6cm
- Fine sand layer.....5cm
- Crushed stone base layer.....15cm

**b. Residential Street “StU7”**

The location for the construction of the street “StU7” is in ARM district 2 and begins from the street “SrU4”. The terrain is mostly stable, healthy, with no visible signs of existing landslides and landslides that could possibly arise. The total length of the street is 594m. Figure 17 shows the current condition of the street.



Figure 17 Current condition of the street StU7 in ARM district 2  
Source: CeProSARD’s archive

The street is planned to be made with two roadway lines with variable width of 7m and sidewalks on both sides of the street with a width of 1.5m. The cross slope of the street profile has been adopted as one-sided along the entire length and is 2.5%. This type of construction of the slope allows natural flow of the storm water and its easier collecting and drainage in to the storm water system.

The construction of the street “StU7” will be performed on the following way:

- Wearing Course AB11 (Asphalt concrete layer).....5cm
- Bearing Course BNS22.....7cm
- Street base crushed stone layer.....30cm

The sidewalks will be made with interlock concrete tiles placed crushed stone base layer with the following dimensions:

- Interlock concrete tiles.....6cm
- Fine sand layer.....5cm
- Crushed stone base layer.....15cm

**c. Residential street “StU 12”**

The location of the street “StU 12” is in ARM district 2 and begins from the street “StU 7”. The terrain is mostly stable, healthy, with no visible signs of existing landslides and landslides that could possibly arise. The total length of the street is 270m. Figure 18 shows the current condition of the street.



Figure 18 Current condition of the street StU 12 in ARM district 2  
Source: CeProSARD’s archive

The street is planned to be made with two roadway lines with wide 7m and sidewalks on both sides of the street with a width of 1.5m. The cross slope of the street has been adopted as one-sided along the entire length and is 2.5%. This type of construction of the slope allows natural flow of the storm water and its easier collecting and drainage in to the storm water system.

The construction of the street “StU12” will be performed on the following way:

- Wearing Course AB11 (Asphalt concrete layer).....5cm
- Bearing Course BNS22.....7cm
- Street base crushed stone layer.....30cm

The sidewalks will be made with interlock concrete tiles placed crushed stone base layer with the following dimensions:

- Interlock concrete tiles.....6cm
- Fine sand layer.....5cm
- Crushed stone base layer.....15cm

**5.2.3 Construction of retaining walls**

Construction of retaining walls is planned for safety on certain sections of the route. The retaining walls should be placed on concrete foundations MB30; MAR 500/600; RA400/500 with d=35cm. The foundation should be reinforced with reticulate armature R385 and R84. The retaining walls should be constructed as concrete

reinforced with MB30, with wall thickness  $d=25\text{cm}$ , variable height. For reinforcement is used reticulate armature R335 and R196 and anchors of armature  $\Phi 12$  in the walls and foundation.

Table 20 Construction of retaining walls

ARM district 2					
Street	Alignments of the retaining wall km	Concreting of foundation for retaining wall $200 \times 35 \text{cm} / \text{m}^3$	Concreting of retaining wall $\text{m}^3$	Double Sided reticulate armature R335 and R196 / kg	Anchors with $\Phi 12 / \text{kg}$
SrU4 2 phase <sup>3</sup>	0+420,00 H=376cm d=25cm L=1455cm	19	18	620	480
StU7 <sup>4</sup>	0+160,00 H=252cm d=35cm L=1040cm	20	22	660	525
	0+180,00 H=252cm d=35cm L=1360cm				

Source: Main project for construction of streets "SrU4" and "StU7"

## 5.2.4 Water supply system

The hydraulic calculations are made for ARM district 1, ARM district 2 and ARM district 3 up to elevation of 630m.a.s.l, covered by the Detailed Urban Plan (DUP). The water supply of the middle water supply zone of the city of Bitola covers ARM district 1, ARM district 2 and ARM district 3. The water supply system should provide sanitary water to the buildings that gravitate towards the streets. Also the system should provide hydrant water from the city water supply system. The alignments of the water supply system are passing through construction land that is partly built under the street construction of the streets as it is shown in Figure 19.

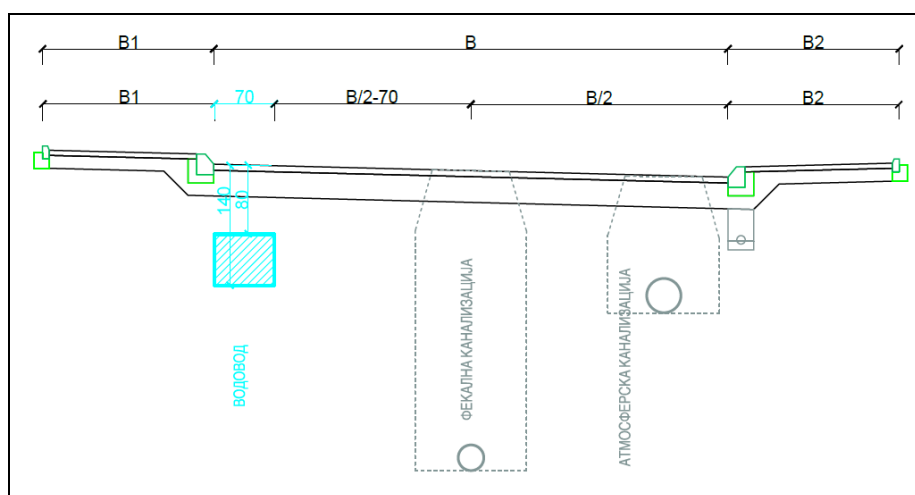


Figure 19 Location of the water supply system in street profile - placed on the higher side of the street  
Source: Main project for linear infrastructural construction – construction of water supply system in ARM district 1

The connection of the water supply system of the area to the city water supply system is planned to be made in the node on street "12 Kladenci", the branch of the water supply system on the street "Partizanska" towards the towers block (near the sports hall "Mladost") and the node at the city stadium. As the most suitable pipes are

<sup>3</sup> Data are obtain from the Main project for construction of street "SrU4" tech. no.01-05/13

<sup>4</sup> Data are obtain from the Main project for construction of street "StU7" tech. no.02-05/13

selected polyethylene water pipes HDPE 100 with a different diameter of OD 110mm and OD 160mm and working pressure of 10 bars. Fire hydrants and connections are also planned to be set on the water supply system.

The hydraulic calculation of the water supply system in the project documentation is made on the basis of the structure of the consumers. With the Detailed Urban Plan (DUP) a mixed structure of consumers is planned. There are planned to be built family, business and administrative buildings. The table below shows the needs for **drinking water** for ARM district 1 and 2 and the need for fire water of 40 l/sec for two fires.

Table 21 Determination of water consumption to an area ARM district 1

Types of consumers	Number of consumers	Water supply norm l/day	Total consumption l/day	Average daily consumption	
				Q aver./day l/day	q aver./day l/sec
Permanent consumers	4,197	300	1,259,100	1,259,100	14.6
Daily consumers	10,843	50	542,150	542,150	6.3
Hotel consumers	1,848	250	462,000	462,000	5.4
Fire water					
<b>Total</b>	<b>15,040</b>		<b>1,801,250</b>	<b>1,801,250</b>	<b>20.9</b>

Source: Main project for construction of infrastructure – construction of water supply system on the street SRU 1 for ARM1

Table 22 Determination of water consumption to an area ARM district 2

Types of consumers	Number of consumers	Water supply norm l/day	Total consumption l/day	Average daily consumption	
				Q aver./day l/day	Q aver./day l/sec
Permanent consumers	373	300	111,900	111,900	1.3
Daily consumers	2,696	50	134,800	134,800	1.6
Fire water					
<b>Total</b>	<b>3,069</b>		<b>246,700</b>	<b>246,700</b>	<b>2.9</b>

Source: Main project for construction of infrastructure – construction of water supply system for ARM2

For the construction of the water supply system in ARM district 1 polyethylene water pipes HDPE 100 are selected as the most suitable with a diameter of OD 110mm and OD 160mm and working pressure of 10bars. Underground fire hydrants and connections are planned to be set on the water supply system. Plumbing knobs, in which the water supply lines are crossing, and which are used for regulation (shut-off) of the water flow, are set for operational handling of the water supply line.

Table 23 Elements of the water supply system in ARM district 1

ARM district 1					
Street	Profile	Length of the water supply system (m)	Pipes	Number of knobs	Number of fire hydrants
SrU2	9	271.04	HDPE100 OD160/10bars	2	2
	26		HDPE100 OD110/10bars	1	/
SrU3	12	296.30	HDPE100 OD160/10bars	4	1
SrU4	16	408.12	HDPE100 OD160/10bars	5	1
StU5b	17	137.80	HDPE100 OD160/10bars	1	/

Source: Main project for construction of the water supply system

The water supply system in ARM district 2 consists of a water supply line for **drinking water** and a water supply line for technical water. **The water supply line of technical water is from hydro ameliorative system – Strezevo. It starts from the manhole of a pipe located on the street SRU1. Water supply line for drinking water in ARM district 2, is separated from the water supply line of technical water. Both systems have separate manholes and are constructed as separate lines. Supply of technical water from system of PE “Strezevo” is for the objects (water manholes, park hydrants and house connections) on the streets “SRU4”, “SRU5”, “STU7” and “STU12”. This water supply line complements the need for water for a part of ARM district 2, thus considering the principles for**



sustainable management with water taking into account maintenance and improvement the water regime<sup>5</sup>.

For the construction of the water supply system in ARM district 2 polyethylene water pipes HDPE 100 are selected as the most suitable, with a diameter of OD 160mm and working pressure of 10 bars. Fire hydrants, water manholes and house service connections are planned to be set on the water supply line for sanitary water. On the water supply line for technical water are planned the following elements: water manholes, park hydrants and house service connections. The reinforced concrete water manholes are with dimensions 120/150cm. The thickness of the walls, the cover and the floor is d=15cm. They are made of concrete MB30, reinforced from both sides with armature Q188. The manholes are covered with circular covers according to standard EN 124 and load class D 400.

Table 24 Elements of the water supply system in ARM district 2

ARM district 2				
Street	Length of the water supply system (m)	Pipes and hoses	Number of manholes	Number of fire hydrants
SrU4 part 1	200	HDPE100 OD160/10bars L=200m OD 90 L=76m	2	1
SrU4 part 2	1,450	HDPE100 OD160/10bars L=1,450m OD 90 L=304m OD 32 L=700m	6	3
StU7	1,240	HDPE100 OD160/10bars L=620m HDPE100 OD110/10bars L=620m OD 32 L=600m	3	3
StU12	590	HDPE100 OD160/10bari L=290m HDPE100 OD110/10bari L=300m OD 32 L=200m	4	1

Source: Main project for sanitary and technical water in ARM district 2

## 5.2.5 Storm water system

The basin of the River Kurderes is regulated in the area near the south boundary of the site ARM district 1. The discharge of storm water is designed to be performed at appropriate location. At the end of the system, it is predicted, the water from all channels to be collected in a common collection channel.

The storm water system in ARM district 2 is designed to collect the storm water from the buildings and the streets and to discharge it to the recipient on the north boundary of the area covered by the ARM district 2 where there is an open channel with profile 2mx2m by which the River Kurderes is regulated. The storm water system is planned to be set along the streets. The depth of the channel in which are placed the pipes for storm water is from 1.5m to maximum 3.8m. The width of the channel is 1.2m. After the excavation of the canal is made planning of the bottom and installation of the pipes, and then is approach towards filling of canal trenches. Filling of the excavated trenches will be performs in layers from 20-30cm with compacting. Treated technical water from the buildings and the water from storm water system of the streets, after the mechanical treatment in a sedimentation system the water will be discharged into the recipient.

Construction of the complete sewerage system for the two districts ARM1 and ARM2 is assumed in the overall project, but is not part of this subproject, and is under the municipality of Bitola responsibilities and competences. For district ARM1 the main sections have been recently completed, and all other sewerage system arms from the service streets are under the construction as well as construction of the sewerage system for the streets in ARM2 district. All these works will be completed prior to commencement of the construction works under this subproject.

As relevant, for projecting the storm water system is taken rain with duration of 15 min. and intensity of

<sup>5</sup> Project of infrastructure and construction of street and infrastructural instalations in 'arm district 2 – DOOEL "Formi" Bitola, pg.19.

85l/sec/ha with return period once in two years. The relevant intensity of the rainfalls is  $85 \times 0.69 = 58.65$  l/sec/ha<sup>6</sup>.

In the project documentation, appropriate storm water pipes with diameter according to the hydraulic calculation and production of waterproof manholes in order to provide water tightness to the entire network are planned to be used. The manholes are round shaped, with a diameter of 100cm and 150cm. They are made of waterproof concrete MB30, constructively reinforced with MA type R 308. The covers are class "D" and they are made of cast iron. Mounting street gutters with bars connected to PVC pipe ND200 with L= 2.00m will be used for drainage of the storm water from the streets.

Table 25 Applied pipes and elements of the storm water system for the streets in ARM district 1

ARM district 1					
Street	Profile	Length of the storm water system (m)	Pipes	Number of manholes	Number of street gullies
SrU2	9	262.95	ID300/SN8 L=190.65m ID400/SN8 L=72.30m	7	18
SrU2	10	277.45	ID300/SN8 L=249.10m ID400/SN8 L=28.30m	6	
SrU3	13	107.00	ID300/SN8 L=70.00m ID400/SN8 L=37.00m	3	10
SrU3	14	69.00	ID300/SN8 L=69.00m	2	
SrU3	18	80.00	ID300/SN8 L=80.00m	2	
SrU4	22	113.65	ID300/SN8 L=113.65m	3	11
SrU4	23	127.00	ID300/SN8 L=127.00m	3	
SrU4	28	137.05	ID300/SN8 L=137.05m	3	
StU5b	29	118.00	ID300/SN8 L=118.00m	3	3

Source: Main project for linear infrastructural construction – construction of storm water system in ARM district 1

The position of the storm water system in street profile in ARM district 1 is presented in Figure 20.

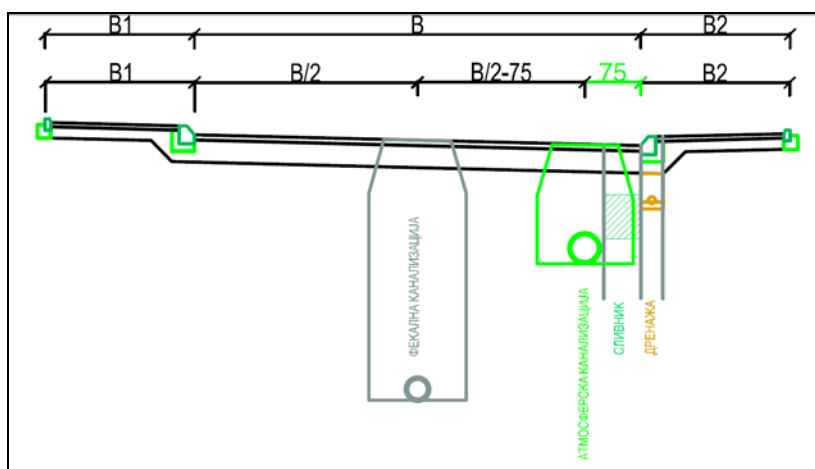


Figure 20 Location of the storm water system in street profile

Source: Main project for linear infrastructural construction – construction of storm water system in ARM district 1

The gullies that are set on the streets in ARM district 2 are typical street gutters with pipe diameter Ø400, metal grid RP-511, drainage pipes PE Ø200 and connections.

Table 26 Applied pipes and elements of the storm water system for the streets in ARM district 2

ARM district 2				
Street	Length of the storm water system (m)	Pipes and hoses	Number of manholes	Number of street gullies
SrU4 part 1	80	ID150/SN8 L=30.00m ID600/SN8 L=80.00m	2	6

<sup>6</sup> Main project for linear infrastructural construction – construction of stormwater system in ARM district 1 and ARM district 2

SrU4 part 2	725	ID150/SN8 L=270.00m ID300/SN8 L=170.00m ID350/SN8 L=120.00m ID400/SN8 L=420.00m	19	20
StU7	615	ID150/SN8 L=220.00m ID300/SN8 L=140.00m ID350/SN8 L=260.00m ID450/SN8 L=195.00m	20	14
StU12	270	ID150/SN8 L=120.00m ID350/SN8 L=170.00m ID400/SN8 L=100.00m	14	8

Source: Main project for linear infrastructural construction – construction of storm water system in ARM district 2

## 5.2.6 Public lighting

The electricity for the public lighting in the ARM district 1 and 2 is planned to be supplied by construction of new transformer stations. The photometry of ARM district 1 and 2 is determined based on the light classes of streets for motor and mixed traffic which are made in accordance with CIE 115 (1) where all streets are divided into five classes from M1 to M5. According to the urban plans, the streets are divided into different areas which are dictated by the required brightness levels on the surface of the street and the average horizontal drive light. Because the area has various purposes in different parts, the photometry is designed separately for each street.

**Power distribution cabinets** - The power distribution cabinets that will be used are from EVN, type A and marked with KRO-A. The cabinets set on the streets will be numbered accordingly. The electricity used by public lighting will be measured by one three-phase electricity meter 40A and one tariff electricity meter which will be placed in the power distribution cabinets. Also the power distribution cabinets will include complete electrical equipment with light relay and timer for managing the lighting in two modes of night. The first mode uses 50% of the capacity of the public lights and the second 100%.

**Cables** – The cables that are used for creation of the network for public lightning in ARM district 1 and 2 are set in underground conduit with a depth of 0.8 x 0.4m. A layer of fine sand, 10cm thick is applied on the bottom of the underground conduit before the cables are set. An aluminum cable type PPOO – Al 4 x 25mm<sup>2</sup> will be used from the transformer station TS 10/0.4kV to the power distribution cabinets. A cable type PPOO – Al 4 x 10mm<sup>2</sup> will be used as a supply line in the electric network. The cable is directed from the command cabinet and by using the system Inter-Enter through concrete foundation penetrates the terminal box of each light pole, where it is connected on automatic fuse of 16A. In the same underground conduit, a cable type PPOO – Al 4 x 2.5mm<sup>2</sup> will be placed and with the help of an electric choke will enable the lights to work in two modes of the electric power 50% and 100% with 250W. Also a galvanized tape 30 x 40mm is placed in the underground conduits where the cables from the transformer station are set. The galvanized tape is used as a protective line from excessive contact voltage. This tape connects to the anchor plate of each light pole.

A cable type PPOO – Al 4 x 16mm<sup>2</sup> is used for the lightning on the streets SrU2 and SrU3. Also, this type of cable is used for lightning of a part of the street SrU4, which starts from the street SrU1 and goes towards the city stadium.

**Foundations** – The foundations on which the metal light poles are set with height 8m above the soil, for each lightning place are prepared on site. They are made with concrete MB30 and with dimensions 0.9 x 0.9 x 1.0m. In order to insert the power supply cable and the command cable a PVC pipe with a diameter D = 70mm is placed in the foundation.

**Metal light poles** - The metal light poles are 8m high above the ground and are made in a form of a telescope with three different circular sections that are given in the graphic part of the project. The poles are straight and on them is placed pound long 1m. All metal parts are painted with waterproof gray paint. The poles have a terminal box set on 1.5m height from the ground containing two 16A automated fuses and a connector for the cable with 8 places. For the lightning of the street SrU2 are used 10 metal light poles with two lamps.

**Lights** – For public lightening, sodium lights with 250W will be used. The body of the light will be with anodized aluminum, protected from corrosion and chemical influences by phosphatase, painted with metallic gray paint. The body of the light is completed with the needed equipment for startup and from the bottom side will have glass with increased level of protection IP65. The used lights should satisfy the European standards EN 60598-CEI 34-21 and I EN 60529, as well as UNI EN ISO 9002. The lights should match the security norms for flash Zone 1 for urban environment.

The equipment is explained in details in the technical documentation.

### 5.3 Alternative sources

In order to provide the most suitable solution, several alternative approaches are analyzed in detail. One of the solutions is partial to solve the infrastructural network by continuous construction of water supply and storm water system, as well as street construction and public lightening. However, this solution is not accepted because it will lead towards excavation of the newly constructed streets. This is because the overall infrastructure (necessary for the operation of the planned areas for construction) is conducted under the surface of the streets and sidewalks.

An alternative option is considered for construction of storm water system, as well. Examined is the possibility of storm water system to be built with open channels and natural catchment areas that will collect the storm water and take it in the regulated basin of the River Kurderes. However, the technical characteristics and configuration of the terrain do not allow construction of open channels or natural catchment areas. This is the main reason why the engineers in the community and the project design team considered that there is no other alternative for the implementation of the storm water system in the area. The project was developed in accordance with existing standards, norms and regulations.

### 5.4 Conclusion and recommendations

The project is in accordance with the existing positive laws and regulations in the country. It is part of the general urban plan (GUP) of municipality Bitola and DUP for ARM district 1, 2 and 3. In preparation of the documentation are used geodetic situations in size R 1:1000 for municipality Bitola, analyzing the terrain and determining the spatial limitations of the location.

For determination the quantities and intensity of precipitation for the dimensioning of storm water system are used calculations and technical documents in force in the Republic of Macedonia.

The technical solution is in line with the positive regulation, or any applicable laws, by-laws and standards for the construction and urban planning in the design of linear infrastructure systems and water supply line, sewerage, streets construction and public lighting. It is important that municipality Bitola proposed construction of these infrastructural linear systems in the settlement "Zlaten Rid" as its highest priority on the basis of public hearings and various demands of residents. Other benefits in the implementation of the project are developed in the following sections of this appraisal.