2. APPENDIX FOR ENVIRONMENTAL ANALYSIS OF CHAPTER 7.2

7.7.1 Overview of Current Environmental Policy for Railways

(1) EU Environmental Policy in Transport

The various forms of transport have been central to economic growth in the world and to the quality of life of its citizens, transport is well known as a major source of pollution in the world today and various modes of transport are the main source of nitrogen (NOx) and carbon monoxide (CO) which are major pollutants of the urban environment. While other sector have been able to reduce their environmental impacts, the environmental damage caused by the transport sector continues to increase.

In conjunction with its Member States, the Community has tried to develop a global strategy aimed at maintaining mobility while preserving the environment. Obviously, It is up to regional and local governments to introduce measures that are effective and command popular support.

Foremost among these will be the introduction of vehicle producing little or zero emission and the development of rapid, convenient public transport.

In order to achieve a balance in the development of the various transport modes, and cater to the imperative of environmental protection, it is vital that the environmental external cost of transport be taken into account and passed on to the user as part of the price. Adjusting the cost in this way provides for environmental protection on a fair market basis, as laid down in Article 130r (2) of the Treaty of European Union:

"The Community policy shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay. Environmental protection requirements must be integrated into the definition and implementation of other Community policies".

Regarding railway transport in the Community, the long term challenge for European transport policy is to ensure continued development of mobility while at the same time protecting the environment which will mean reducing air pollution, noise levels and the consequences of accidents.

(2) National Environmental Policy and Transport

Basic legislation on environmental protection in Bulgaria was established in the 1960s and amended in the 1970s and 1980s. However this environmental legislation was formulated in the period of central government planning and was so strict as to be unenforceable. Because of this the legislation did not meet the required objectives at that time. After a market-based economy was introduced, realistic requirements for environmental legislation have been formulated.

The environmental challenge for Bulgaria in the economic transition period is to ensure maximum environmental benefits not only from economic growth but also from economic reform and structural changes, by integrating environmental concerns into economic decisions. The following instruments were introduced to enhance implementation of the environmental

policy.

1) Regulatory Instruments

a. Standards

The environmental standards created by the former central planning based economic system were so strict that they were unenforceable, they were, in many cases, more stringent than WHO guidelines. More realistic requirements for environmental protection were therefore introduced.

b. Enforcement

Charging fines when environmental standards are exceeded is major instrument of environmental protection. The fines levied go to an Environmental Protection Fund for investment in environmental protection projects.

2) Assessing Environmental Impact

The Environmental Protection Law introduced procedures for Environmental Impact Assessment. The EIAs are mandatory for the development or refurbishment of major projects and bodies such as Environmental Experts Council and Regional Environmental Inspectorates are charged with ordering and approving the EIAs.

3) Economic Instruments

The laws impose user charges on usage of natural resources as well as waste discharge in order to enhance environmental protection, economic instruments for user charge policy are introduced

- Solid waste charges (households and enterprises)
- Water use charges (water supply and waste water treatment)
- Waste water discharge charges (discharge to sewerage system)
- Administrative charges (environmental administrative actions)
- Charges on quarrying (quarried materials)
- Timber taxes and charges (domestic timber sales and export)
- Pollution fines (excess of permissible level)
- Car import duties (additional tax on cars older than 10 years)
- Tariff reduction on imports (environmental equipment)
- Excise tax differentiation (tax on leaded gasoline 10% higher)

4) Environment and Transport

There are only a few items related to the transport sector in the Environmental Protection Law and the most of these concern vehicle emissions form lead containing gasoline. The 1994 Environmental Strategy Update emphasizes to increase use of lead free gasoline. This will require incentives for use of lead free gasoline.

In addition, more stringent emission levels for vehicles, especially diesel engines for buses, are suggested. The Ministry of Environment has conducted a pilot project to rebuild bus engines in collaboration with the Sofia City Municipality.

Moreover, growth in the number of vehicles and in traffic in major cities, particularly Sofia

will mandate the limitation of emission levels by motorcars. In cooperation with the Ministry of Environment, Ministry of Transport and Sofia Municipality, strong measures for limitting motor vehicle emission levels in the city centers will be taken. Other steps, such as improvement of parking control, promotion of public transport to reduce commuter traffic by car, will be considered.

(3) Environmental Aspects of the Existing Railway System

Four major environmental issues related to railways were identified in the study: Railway Reconstruction Project (RRP) by EBRD, 1) waste water discharge and treatment; 2) waste disposal; 3) chemical application; 4)veterinarian control and coach hygiene.

Railway rehabilitation would improve its competitiveness over its main competitor, automobile transport, and would bring overall environmental benefits.

a. Waste water discharge and treatment

Waste water discharge is the most significant cause of systematic violation of Bulgaria's environmental standards by railways. BDZ has nine major depots and each of them had to pay fines in accordance with water sampling data which showed allowed levels had been exceeded. BDZ paid 1,238,485 Leva (equivalent to US$44,000) in 1993 as fines. The Sofia depot accounted for 77% of these fines and Durujba Depot paid 15%. It is reported that proactive countermeasures, housekeeping and low cost solutions, were carried out in depot and workshop. As a result of these activities to protect the environment utilizing sediment depositors and treatment facilities for waste water, the pollution issues was significantly improved.

b. Solid waste in depot and workshop

Solid waste is generated in both in operation and maintenance at depot and workshop. Characteristics of solid waste are caused by passenger waste in depot and maintenance stations and freight waste leftover in wagon from freight cargoes. This left over waste such as chemical freights is easily lead to soil and ground water contamination and create health risks for the staffs. In addition nickel batteries stored on the ground also occurs the contamination.

c. Chemical application for track maintenance

Chemicals have been used for track maintenance with a new to track safety. However, chemicals should be used carefully because they may spread to surrounding areas such as agricultural lands.

d. Veterinarian control and coach hygiene

This is quite an important aspect of the environment. There are thirteen (13) specialized quarantine stations able to operate in accordance with the hygiene regulation incorporated in the Veterinarian Activity Act. However, two items would need to be improved; regulations for proper treatment of freight cars after use and instructions for dealing with the consequences of accidents involving hazardous cargoes. Only one fine was reported for the improper handling of railway cars in connection with transportation of hazardous car.

(4) Environmental Affects of Existing Plans Formulated for the Railways

Two railway plans have been formulated 1) Bulgaria: Railway Rehabilitation Project by EBRD (RRP), 2) Management Plan of BDZ for the Period up to 2005 by BDZ (BDZ2005 Plan) and one on-going plan, Railways' Environmental Performance Improvement Project (REPIP). These three plans aim to upgrade the service level in the short term. A comparison of the two plans formulated is given in following table:

Table 7.7.1 Environmental Issues and Countermeasures in Existing Railways Rehabilitation Plan

Policy Plans	Issues	Countermeasure
EBRD Railway Rehabilitation Project	1) Waste water discharge and treatment 2) Solid waste 3) Chemical application 4) Veterinarian control and car hygiene	Recommendation: 1) Environmental management capacity 2) Setting environmental priorities 3) Incorporating environmental concern in the BDZ restructuring EBRD Loan: 1) Rehabilitation of locomotive workshop (water treatment plant and sediment treatment plant for waste drainage water from the washing of the locomotives and wagons) 2) Ballast management wagons for ballast pollution outputs
BDZ 2005 Plan	1) Breach of environmental standards 2) Uncontrolled disposal of waste 3) discharge water from passenger cars 4) Improper application of chemicals 5)Improper veterinarian control 6) insufficient hygiene norms and procedures	1) Improvement of environmental condition in depot and workshop and its vicinity 2) Adoption of certain standards for registered environmentally hazardous material used or transported by train 3) development of environmental technology coordinated with European railways

Source: JICA Study

The Railways' Environmental Performance Improvement Project (REPIP) has commenced and is financed by the European Union. The objectives of the project are :

- to develop a comprehensive phased strategy for strengthening the organizational and management arrangements, and updating the existing facilities of BDZ for veterinary and hygiene control at border crossings, and

- prepare detailed organizational management proposals, engineering designs and technical specifications, and program for implementation of the first phase of the approved plan.

7.7.2 Social Environmental Impact Examination

The most considerable aspects of social impact of the plan, reducing staff, raising tariffs, ceasing service in lines, are discussed in this clause with qualitative analysis. The results of the social environmental condition survey on railway service carried out in feeder lines were taken into account in this examination.

(1) Overview

1) Reducing Staff

The plan proposed reducing staff number gradually utilizing the difference between staff recruitment and staff wastage which is an acceptable method and not controversial for the people concerned. It is therefore considered that the social impact from this activity is not significant.

2) Tariff Increases

A passenger tariff increase of 3-5% annually is proposed for the years 1998-2002, of 10-15% annually year 2003-2005 and after year 2005, 2% annually, however, fares have already increased by over 700% during February to April 1997. The tariff is fixed based on market pricing principles and further increases in line with the growth rate of GDP would be acceptable, so that the social impact of tariff increases is considered not significant.

3) Ceasing Service on Lines

It would seem that discontinuing service on feeder lines would be logical given that frequency of current railway operations in feeder lines has greatly decreased and passenger and freight demand are also much less. The management plan intends to have no improvement on this matter. In addition, alternative transport such as buses and trucks are available at similar cost. Consequently the social impact is deemed not to be significant when the plan is implemented.

(2) Reducing Staff

1) Present Situation of Projected of Staff Reducing

Further staff reductions were projected in the PFR (Program for Financial Rehabilitation) and the Management Plan for BDZ up to the Year 2005. This has been overtaken by the policy of a new Management Team which had already reduced the staffing levels and has set new targets up to the end of 1998. The current staffing position and specific forecasts are as follows:

Table 7.7.2 Current Staffing Position

Actual Number of staff at June 1997	56,573
Planned number of staff July 1997	52,121 (Manpower Plan)
Actual number of staff July 1997	54,599
Estimated staff at the end of 1997	51,200 *
Planned number of staff at end of 1998	44,200 (Operations only)*
Planned number of staff at end of 1998	47,300 (Whole of BDZ) *

* These are the figures that were included in the Rehabilitation Plan in April 1997 and are also included in the 1997 -1998 contract between the State and BDZ.

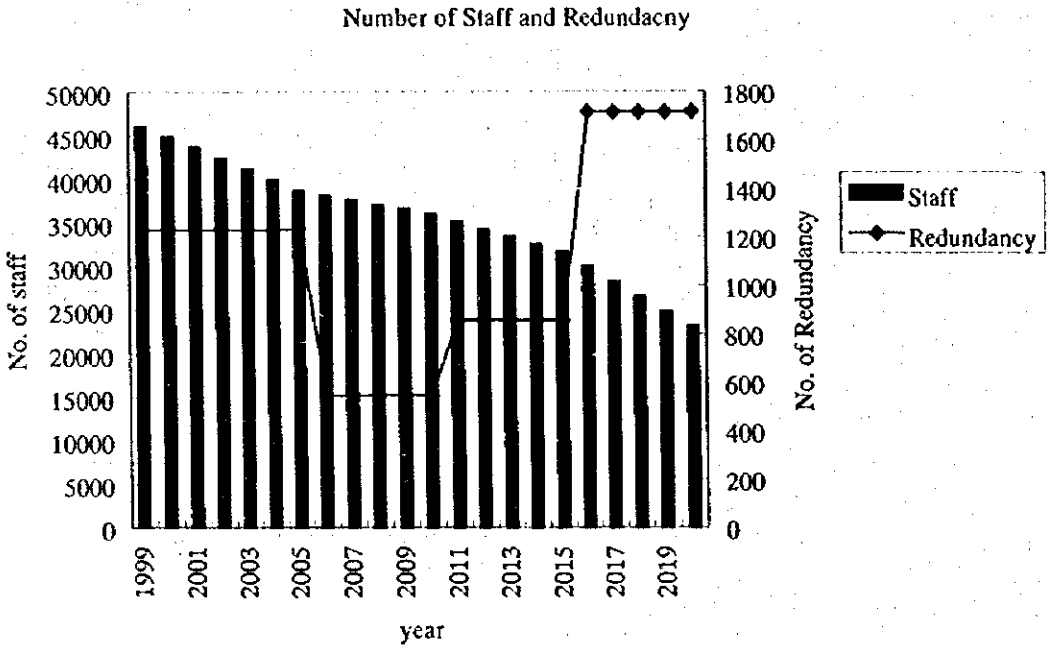
Source: JICA Study

The target staffing figures for 1997 and 1998 assume the implementation of a considerable number of staff reduction schemes included in the original 3 Year Plan. This plan is largely focused on the establishment of Joint Venture Companies or Joint Stock Companies for construction, maintenance and consultancy activities.

2) Reducing Staff and Social Impact

A Strategy for reducing the numbers of staff in the plan is based on the manipulation staff recruitment and staff wastage so that the social impact on this activity is minimal.

It is considered that the two key ingredients in producing an acceptable, non-controversial approach to reducing staff numbers will be Staff Recruitment and Staff Wastage. Providing recruitment can be regulated to provide a significantly lower annual figure than natural staff wastage, then it should be possible to make acceptable staffing and establishment reductions without causing undue problems. It is therefore considered that the social impact caused by staff reductions under the plan will be minimal.



Source: JICA Study

Figure 7.7.1 Proposed Number of Staff and Redundancy 1999-2020

(3) Tariff Increases

1) Summary of Policy on Tariff Increases

In the Management Plan, tariff increases both for passenger and freight tariff are proposed summarized below. The most important effect of tariff increases on social impacts is from passenger tariffs. For the first five years from 1998 to 2002, the rate of increasing is 3 to 5% a year with a market related tariff and for the next three years from 2003 to 2005, the rate of increasing is 10 to 15% a year with the tariff structure set by individual origin/destination station pairs. Beyond year 2005, rate of increasing is 2% a year as the new tariff structure is adjusted and fine tuned. Before the above plan proposal, the tariff was dramatically increased by 700% early 1997.

Table 7.7.3 Summary of Proposed Tariff Increases

Category	Subject Year	Tariff Increases
1. Passenger	1998-2002	3-5% a year with a market related tariff
	2003-2005	10-15% a year with a change in the tariff structure set by individual origin/destination station pairs
	over 2005	2% per year as the new tariff structure is adjusted and fine tuned
2. Freight		
1) International		Fixed by international tariff agreements
2) Ports Tariff	early 1998	20-30%
	after that-2015	small increase e.g. 2% a year
	Beyond 2015	a sharp overall decrease in tariff e.g. 20-25%
3) Domestic	early 1998	10-20% increase
	1998-	a small increase

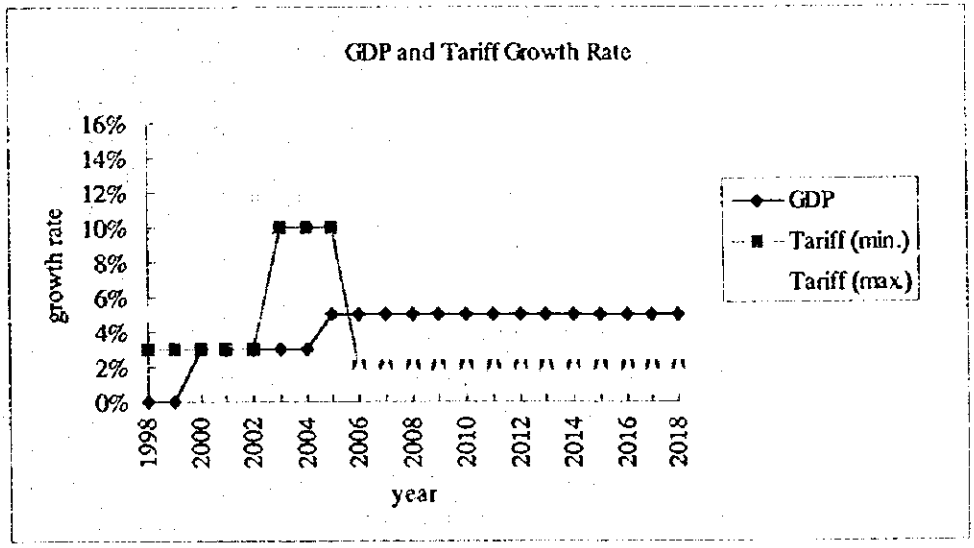
Source: JICA Study

2) Tariff Increase and Social Impact

In response to the economic growth (GDP) forecast, there are three phase; 0% growth per year up to year 2000, 3% growth per year 2000-2005 and 5% growth per year beyond year 2005.

It should be mentioned that tariffs have already been increased by 700% from February to April 1997 based on market pricing principles.

In terms of duration of the plan, average growth rate of GDP is at 4.13% while average tariff increase rates are at 3.26% to 4.35%. It is considered that this is an acceptable increase rate if when compared to GDP growth.



Source: JICA Study

Figure 7.7.2 GDP Growth and Tariff Increase Rate Projection

In addition, the results of interview survey on railway services show that around 75% of the people would not accept an increase of more than 30%. In other words, it might be said that an increase of less than 30% would be acceptable. Approximately 30% of the respondents agreed on the principle of self financed fares and one third of respondents agreed on fare increases, if the railway service would not be financially sustainable at present .

It is therefore proposed that the maximum tariff increase rate is at 15% for three years from year 2003-2005 that the GDP starts to grow at 3%. The tariff increase rate in other periods is from 3% to 5% which is nearly equal to the GDP growth rate. It is believed that the tariff increase rate will be acceptable to the people so that the social impact of tariff increases will not be significant.

Table 7.7.4 Results of Interview Survey on Tariff for Feeder Lines

4.1 Do you agree that railway services should be self financed from fares?	a. Agree (27.9%) b. Not Agree (72.1%)	No specified reasons (27.3%) There are specified reasons (72.7%):
4.2 If the railway services are not financially sustainable, do you agree that the train fares should increase?	a. YES (33.4%) b. NO (66.6%)	No specified reasons (24.6%) There are specified reasons (75.4%)
4.3 What level of fares increase would cause you to stop using the train services?	a.10% (24.2%) b.30% (24.4%) c. 50% (23.1%) d. 75% (4.4%) e. 100% (8.7%)	f. 200% (1.1%) g. over 200 % (1.1%) h. I will travel by train, does not mater the fare (13.1%)

Source: Household Interview Survey (JICA)

(4) Ceasing Service on Certain Lines

Referring to the train operation schedule of feeder lines, some examples are shown in the following table, showing low frequency of train operation including passenger, freight and combined trains. Some lines are operated daily, however one of the lines is operated only on Saturday and Sunday.

Table 7.7.5 Schedule of Feeder Lines

No.	Subject Lines	Current Operation Schedule (Sep.1997)
1.	No.16 Septiemvri - Dobrinishte (119 km)	two times (P) and one time (f) a day
2.	No.21 Cherven Briag - Oriahovo (104 km)	two times (P) and one time (f) a day
3.	No.25 Levski - Troyan (83 km)	two times (P) and one time (f) a day
4.	No.41 Goma Oriahovitsa - Elena (44 km)	Once a day on Sat. and Sun.
5.	No.91 Samuil - Silistra (113 km)	2 times a day (combined)

Source: JICA Study

In this manner, frequency of train operation is much less and future demand estimated is also less due to the decline of major industry along the lines while alternative transports such as buses and tracks are introduced with more frequency service.

The results of the interview survey shown in the table below. Nearly half of respondents say that alternative transport such as buses is required either if tariff increases or lines cease. In other word, if there is alternative transport such as bus service, it is less impact on ceasing lines.

This is the fact that 10% of respondent agree while 90% of respondents disagree on ceasing lines, however, viewpoints from car ownership (44%) and frequent use of railway (36%), those number shows positive aspect of alternative transport existents.

So small number of people affected will use alternatives more frequent mean of transport, so the social impact of ceasing service on these lines will not be significant.

Table 7.7.6 Interview Survey Result on Ceasing Service in Feeder Lines

2.1 Do you have own car or Does your family have own car? If "YES", how many cars do you have?	a. YES (44.2%) b. NO (55.8%) If YES, please specify how many:	One 93.6% Two 5.2 % Three 1.0% Five 0.2%
2.2 Which transport mode do you most frequently use? (Select one item)	a. Railway Train (36.3%) b. Tram (0.4%) c. Bus (36.5%) d. Trolley Bus (0.4%)	e. Private Car (17.7%) f. Bicycle (3.0%) g. Other (Specify) (5.7%)
4.4 What would you then do instead? (If railway tariff increased)	a. Use alternative bus service (53.8%) b. Take a taxi (-) c. Hitch-hike (2.6%)	d. Travel elsewhere (-) e. Not travel at all (24.8%) f. Other (18.9%)
4.5. If there is alternative transport available, do you use the railway?	a. Yes (51.7%) b. No (48.3%)	No specified reasons (27.9%) There are specified reasons (72.1%)
4.6. If the railway services in your local area ceased operations would you agree?	a. Yes (9.7%) b. No (90.3%)	No specified reasons (21.5%) There are specified reasons (78.5%)
4.7 If the railway services in your local area ceased operations, what would you require?	a. I would need alternative transport (41.4%)	b. I don't require any thing (46.2%) c. Other (Specify) (12.4%)

Source: Household Interview Survey (JICA)

7.7.3 Natural Environmental Impact Examination

(1) Initial Environmental Examination (IEE)

An Initial Environmental Examination (IEE) of the plan was carried out using existing data, information and supplementary natural environmental condition surveys on related sites. The plan has been formulated in Chapter 8 and summarized in the following tables.

The Initial Environmental Examination (IEE) is to identify negative impacts in a preliminary way through the Screening and Scoping activities as explained below. Then environmental considerations are assessed, if required. These environmental issues will be considered for further detailed examination in a Environmental Impact Assessment.

- Screening

The purpose of screening of environmental aspects is to identify environmental impacts and social issues which would examined in more detail if a full scale assessment (Environmental Impact Assessment: EIA) is necessary in future.

- Scoping

The purpose of scoping is to clarify the significant environmental impacts which may be caused by the project .

1) Overview

In consideration of the nature of the plan which includes various kinds of institutional programs, and of the improvements of railway, an integrated IEE on this plan was carried out. As a result of Screening and Scoping, two major impacts, 1) waste and 2) noise and vibration during operation stage were identified. However no other major negative impacts were identified.

It was therefore concluded that an Environmental Impact Assessment (EIA) is not required.

Table 7.7.7 Summary of Long Term Management Plan of Bulgarian Railway

Proposed Plan	Components
1. Reorganization of Freight Department of BDZ	
2. Marketing and Sales	1) Freight 2) Passenger
3. Tariff Improvement	1) Freight tariff 2) Passenger tariff
4. Train Operation Plan	1) Competitive train 2) Future high speed train 3) Computerized adaptation of train diagram to forecast demand 4) Train Speed Improvement 5) Plans improving train operation of main issues 6) Planned train for financial projection
5. Facilities and Rolling Stocks	1) Reinstatement of deferred maintenance 2) Investment to combined transport 3) Maintenance and improvement
6. Human Resources	1) Planed manpower /pay level for financial projection 2) Pay system, incentive and management change 3) Personnel and training organization
7. Less traffic density lines	1) Continued rationalization and cost reduction 2) Transfer to related company 3) PSO subsidizing

Source : JICA Study

2) Screenig

As a result of screening, no major impact were identified except noise and vibration and waste. It is concluded that Environmental Impact Assessment is not required at all as follows:

Table 7.7.8 Screening of Long Term Management Plan of Bulgarian Railway

No.	Environmental Items	Description	Evaluation	Remarks (reason)
Social Environment				
1.	Resettlement	Resettlement by occupancy of proposed land	No	Existing ROW is used
2.	Economic Activities	Loss of productive opportunity such as land	No	Less change of economic activities
3.	Traffic and Public Facilities	Influence of existing traffic such as congestion	No	Public facilities exist in the project area
4.	Split of Communities	Split of Communities by obstruction of railway line	No	Non access control cause no obstruction
5.	Cultural Property	Loss of cultural property and falling of values	No	Cultural heritage do not exist
6.	Water Rights and Rights of Common	Obstruction of fishing rights, water rights, and common rights of forest	No	treatment facility exists
7.	Public Health Condition	Deterioration of a hygienic environment by production of refuse and noxious insect	No	Lots of refuse will not produced
8.	Waste	Occurrence of waste dumps and solid waste	Yes	wastes will be produced
9.	Hazards (Risk)	Increase of possibility of danger of landslide and accident	No	Less possibilities to occur
Natural Environment				
10.	Topography and Geology	Change of valuable topography and geology by excavation or filling works	No	Large scale of earth work is not included
11.	Soil Erosion	surface soil erosion by rainwater after land development (vegetation removal)	No	Subjected area is developed already
12.	Ground Water	Change of distribution of ground water by large scale excavation	No	No large scale excavation
13.	Hydrological Situation	Change of river discharge and riverbed condition due to landfill and drainage inflow	No	Subject area is developed
14.	Coastal Zone	Coastal erosion and sedimentation due to landfill or change in marine condition	No	No plan along the coast
15.	Flora and Fauna	Obstruction of breeding and extinction of spices due to change of habitat condition	No	developed land
16.	Meteorology	Change of temperature, precipitation, wind ,etc., due to large scale development	No	There are no large scale development
17.	Landscape	Change of topography and vegetation by land development and harmonious obstruction by structural objects	No	no new construction
Pollution				
18.	Air Pollution	Pollution caused by exhaust gas or toxic gas from vehicles and factories	No	less exhaust gas
19.	Water Pollution	Pollution by inflow of silt, and effluent into rivers and ground water	No	there is treatment facilities
20.	Soil Contamination	Contamination of soil by dust and chemicals	No	No activities with chemicals
21.	Noise and Vibration	Noise and vibration generated by railway	Yes	During operation
22.	Land Subsidence	Deformation of land and land subsidence due to the lowering of ground water	No	already developed area
23.	Offensive Odor	Generation of exhaust gas and offensive odor by facility construction and operation	No	No factor
Overall evaluation		Environmental Impact Assessment (EIA) is required or not	From the results of the evaluation, **EIA is not required.**	

3) Scoping

Noise and vibration due to improvement in operation speed including high-speed trains and waste generation in operational stage shall be examined in more detail when the plan carried out.

Table 7.7.9 Scoping (Long Term Management Plan of Bulgarian Railways

No.	Environmental Items	Evaluation	Remarks (reason)
	Social Environment		
1.	Resettlement	D	Resettlement will not occur due to improvement of existing railway
2.	Economic Activities	D	Important changes in economic activities will not occur
3.	Traffic and Public Facilities	D	Developed lands are used. There is no impact on schools, medical , religious facilities in urbanized areas
4.	Split of Communities	D	Access is already controlled and there is no new split the community
5.	Cultural Property	D	There is no impacts in cultural properties in urbanized areas
6.	Water Rights and Rights of Common	D	Treatment facility exists.
7.	Public Health Condition	D	Large amounts of refuse will not occur
8.	Waste	B	Small amount of waste will be produced in the operation stage
9.	Hazards (Risk)	D	There is little possibility of natural disaster
	Natural Environment		
10.	Topography and Geology	D	Large scale land development is not included
11.	Soil Erosion	D	Large scale soil erosion has not been identified
12.	Ground Water	D	There is no large scale structure affecting the under ground condition
13.	Hydrological Situation	D	No structures will be built on the rivers
14.	Coastal Zone	D	There is no alignment in the coastal area
15.	Flora and Fauna	D	Existing lines are used. There is no valuable flora and fauna.
16.	Meteorology	D	Large scale fills and construction of high buildings are not planned
17.	Landscape	D	No new alignment plan.
	Pollution		
18.	Air Pollution	D	There is no impact on air quality by increasing traffic volume during operation stage
19.	Water Pollution	D	Influence on rivers by discharge water from railway facilities is unknown
20.	Soil Contamination	D	There are no activities causing soil contamination
21.	Noise and Vibration	B	There will be some impact on noise and vibration by increasing the operation speed during the operation stage
22.	Land Subsidence	D	Developed land is used
23.	Offensive Odor	D	There are no factors causing offensive odors

Note1: Evaluation categories:

A: Serious impact is predicted

B: Some Impact is predicted

C: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses)

D: No impact is predicted. EIA is not necessary

Note 2: The evaluation should be made with reference to the Explanation of Item.

Table 7.7.10 Matrix for Scoping Classified by Project Phase

Environmental Factors \ Major facilities, activities / Activities which may cause impacts			Railway Facilities/ Construction of Railway					
			Overall Evaluation	Before Operation		After Operation		
				Reclamation and spatial occupancy	Operation of construction equipment	Occupancy of land	Operation of railway	Accumulation of people and goods
Social Environment	1.	Resettlement						
	2.	Economic Activities						
	3.	Traffic and Public Facilities						
	4.	Split of Communities						
	5.	Cultural Property						
	6.	Water Rights and Rights of Common						
	7.	Public Health Condition						
	8.	Waste	X				X	
	9.	Hazards (Risk)						
Natural Environment	10.	Topography and Geology						
	11.	Soil Erosion						
	12.	Ground Water						
	13.	Hydrological Situation						
	14.	Coastal Zone						
	15.	Flora and Fauna						
	16.	Meteorology						
	17.	Landscape						
Pollution	18.	Air Pollution						
	19.	Water Pollution						
	20.	Soil Contamination						
	21.	Noise and Vibration	X				X	
	22.	Land Subsidence						
	23.	Offensive Odor						

Note: XX: The environmental items to which special attention has to be paid. They might be serious impacts that may affect the project formulation depending on the magnitude of the impacts and the possibility of the measures.

X: The environmental items that may have a significant impact depending on the scale of the project and site condition

No mark: The environmental items requiring no impact assessment since the anticipated impacts are, in general, not significant.

(2) Overall Evaluation of Initial Environmental Examination

The management plan comprises various kinds of institutional programs, improvement plans and a few new developments such as combined transport. In the course of IEE, only a few impacts were identified due to the development a few new facilities. Most of the impacts arising from the plan affect on positive side. It is concluded that EIA is not required for this plan although a few direct impacts, noise and vibration, caused by improvement of railway service such as high speed train operation will be taken into consideration for further detailed examination.

1) Noise and Vibration

a. Noise

Most of the adverse impacts of railways on people could be described as nuisance. Train noise is the most measurable nuisance caused by railways. IEE procedures identified some impacts on noise by the plan, which comprise improvement of operating speed and high speed trains. However as the plans involved existing lines, the impact on noise will be minimal. However some examination of noise and vibration is given as follows:

In comparison with the other transport noise level shown in the following table, railways, e.g. BR electric train, shows that rail's noise level (93-99 dB(A)) remains between aircraft and cars, 110 dB(a) and 80 dB(a) in peak noise level respectively.

Table 7.7.11 Typical Transport Noise Level

	Peak Noise dB(A)	Maintained Noise Level	Position of observer
Aircraft B747	110		250 m below
Passenger Car	80		25 m from train or vehicle
Articulated Lorry	85-90		ditto
Highway Traffic		75-85	ditto
BR Electric (160 km/h)	93		ditto
TGV SE (270 km/h)	99		ditto
Busy road intersection		60 - 70	on side walk
Underground Station	100 - 105		on platform
Train Horn	100 - 110		at 30 m

Source: The environmental impact of railways

The BDZ noise level measured in Sofia residential areas shows rather a higher level of noise compared to reference data shown in Table 7.7.12. In general, train noise can be generated in the following:

- motive power unit: noise from engine and ancillary equipment escaping through exhausts or openings in the ceasing
- wheels running on rails
- aerodynamic effects
- vibrating structure

In another comparison between measured data of BDZ noise level and other country's railways, even high speed trains and different operating speeds, there seems to be little difference among them. For example BDZ express train shows 98 dB(A) of SEL at 90 km/h while TGV SE shows 93 dB(A) at 200 km/h.

Table 7.7.12 Noise Sampling Level and International Comparison

	Type	Speed (km/h)	SEL	L_{max}	Remark
BDZ	Express Train	90 km/h	92.7 - 98.3	84 - 96.5	
	Fast Train	90 km/h	90.1 - 96.1	84 - 89	
	Electric Train	90 km/h	83.6 - 90	70 - 78	
	Freight	60 km/h	87.8 - 97.9	76 - 84	
BR Coach	Passenger	144 km/h	88/90	82/85	Electric
ICE	Passenger	200 km/h	-	86/82	Electric
High Speed Train (HST125)	Passenger	200 km/h	97	94	Diesel
TGV SE	Passenger	200 km/h	93	84	600 m long
BR Intermodal freight	Freight	80 km/h	-	89	
French freight	Freight	80 km/h	-	86	450 m long/ Laeq 64

Note: data shows in dB(A) 25 m from track center. Data of BDZ shows in residential area in Sofia. BG level: daytime; 55.7 dB(A), night; 44.5 dB(A)
Source: JICA Study and The environmental impact of railway

In BDZ's case, the noise generation source can be the motive power unit and wheels running on rails. These stem from issues of railway maintenance that are proposed in the plan. Further improvement will reduce noise level. Consequently impact on noise level will be minimal.

Noise generation on the rails can be reduced by:

- better design of wheels, suspension and brakes to reduce wear,
- regular grinding of rail to remove corrugations
- avoidance of rail discontinuities in sensitive area
- resilient track mountings or fastenings, especially on elevated structure or in tunnels

b. Vibration

Diesel engines generate mainly low frequency sound. This can be radiated to surroundings where it reaches buildings. The main vibrations transmitted to the ground arise from forces between the wheels and the rails. The suspension and bogies of passenger trains, particularly electric multiple units, reduce the viblations. Heavy freight wagons are more likely cause of vibration.

The impact of vibration is potentially serious for structures (3mm/s; historical building, 10 mm/s; residential, 20 mm/s; commercial buildings) and human comfort (above 3mm/s). Typical acceptability criteria of vibration is 0.3 - 2.0 mm/s (The environmental impact of railway).

Table 7.7.13 Vibration level in Sofia Residential Areas

Type	Speed (km/h)	Peak particle velocity (mm/s)
Express Train	90 km/h	0.280 - 0.460
Fast Train	90 km/h	0.280 - 0.420
Passenger Train	90 km/h	0.500
Electric Train	90 km/h	0.230 - 0.400
Freight	60 km/h	0.210 - 0.580

Source: JICA Study Note: data measured 25 m from track center.

In this regard, measurement results of vibration in Sofia residential areas show peak particle velocity that ranges from 0.21 to 0.58 mm/s shown in Table 7.7.1. Also for noise level results,

there seems to be little differences among train category. If can be seen major results vibrations caused by BDZ train in Sofia residential area is well below the acceptability categorized of 0.3-2.0 mm/sec. given above.

In addition, vibration can be reduced at source by the following:

- improved design of suspension and bogies of rolling stock
- vibration-absorbing resilient track

2) Waste

Solid waste is generated in the operation and maintenance phases. The nature of this waste is mainly divided into two categories waste caused by passenger waste which is removed in major depots and maintenance station and, freight waste leftover in wagon from freight cargoes. Source of this impact is predicted in the operation and maintenance of railways.

7.7.4 Environmental Consideration

The considerations will be made in order to enhance positive impacts and minimize negative impacts figured out by results of environmental analysis based on this management plan and for further programs.

(1) Long Term Environmental Policy for the Railways

In response to the management plan, a concrete longer-term environmental policy should be formulated in order to better maintain a sustainable railway environmental condition.

Short term target plans in consideration of environmental aspects was formulated and is being implemented while the long term environmental plan is needed to confirm with the EU treaty 130r (2) which states "environmental damage should as a priority be rectified at source and that polluter should pay". In this regard, the proposed plans should have the environmental management plan based on BDZ's long-term environmental policy so that purpose of this management plan will be environmentally sustainable.

(2) Railways as an Environmentally Advantaged Transport

It is an attempt to present comparative information about transport energy use and emissions from road and railway transport, the Table 7.7.14 shows an order-of-magnitude that railway contributions are significant apparently.

One of the article of EU transport policy recommends the sue of combined transport to its members mainly because of its environmentally friendly aspects and the BDZ management plan include combined transport in compliance with this EU policy.

Table 7.7.14 Typical Transport Energy Use and Emissions

Transport type	Energy Use (KJ/Passenger-km)	CO_2	Nox	SO_2	CO	HC	VOC
				g/passenger-km			
Road Passenger							
Cars	2,000	150	2	0.05	10	1.5	2
Buses	800	40	1.0	0.1	0.5	0.1	0.5
Rail Passenger							
All train	800	80	0.6	0.3	0.2	0.2	0.3
Diesel train	800	80	1.5	0.2	0.2	0.1	0.5
Electric train	800	80	0.5	1.0	0.02	0.001	0.001
Road freight	(KJ/ton-km)			(g/ton-km)			
All road	2,000	250	4	0.3	2	0.5	1.0
Large lorries	1,000	100	3	0.2	0.2	0.3	-
All Rail freight	700	40	0.3	0.3	0.2	0.05	0.1
Diesel	-	40	0.7	0.1	0.15	0.1	0.1
Electric	-	40	0.2	1.0	0.01		0.01

Source: The environmental impact of railways, Note: KJ; kilo-joules ($1J=10^7$erg=0.239 Cal.)

(3) Facilities Development and High Speed Trains

It is recommended that further detail environmental analysis of each comportment plan, particularly high speed train and related facilities development shall be conducted when the feasibility study is implemented.

(4) Planning Standard

Standards should be set for either noise generation or noise reception levels in order to conserve human health and a comfortable living environment. There is no standard related to the noise and vibration emitted by railways in Bulgaria. Maximum train noise (L_{max}) generated at source is subject to upper limits. Examples of source standards are illustrated as follows:

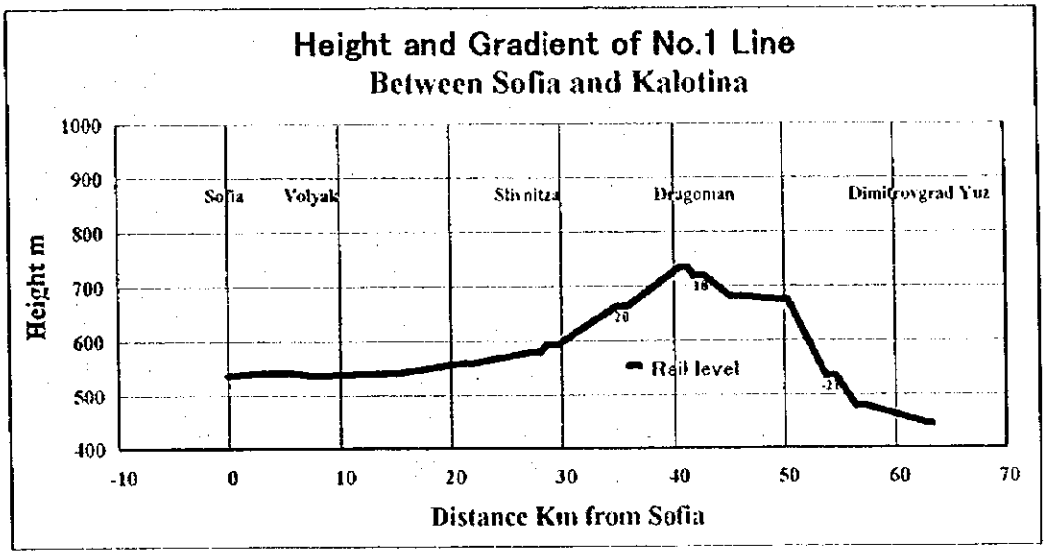
- 90 dB(A) for US diesel Locomotive built after 1979
- 85dB(A) for Danish rolling stock wheel noise
- 96 dB(A) in the specification for Eurostar at 300 km/h

Noise reception standards shall be formulated to define the level of acceptability. Typical standards for 24 hours L_{aeq} at house facade are as follows:

- 70 dB(A)for new railway in Japan
- 69 dB(A) for SNCF TGV, reduced to 64 dB(A) in the latest guideline for application in residential areas
- 65 dB(A) for London Docklands Light Railway's Becton extension (bill)

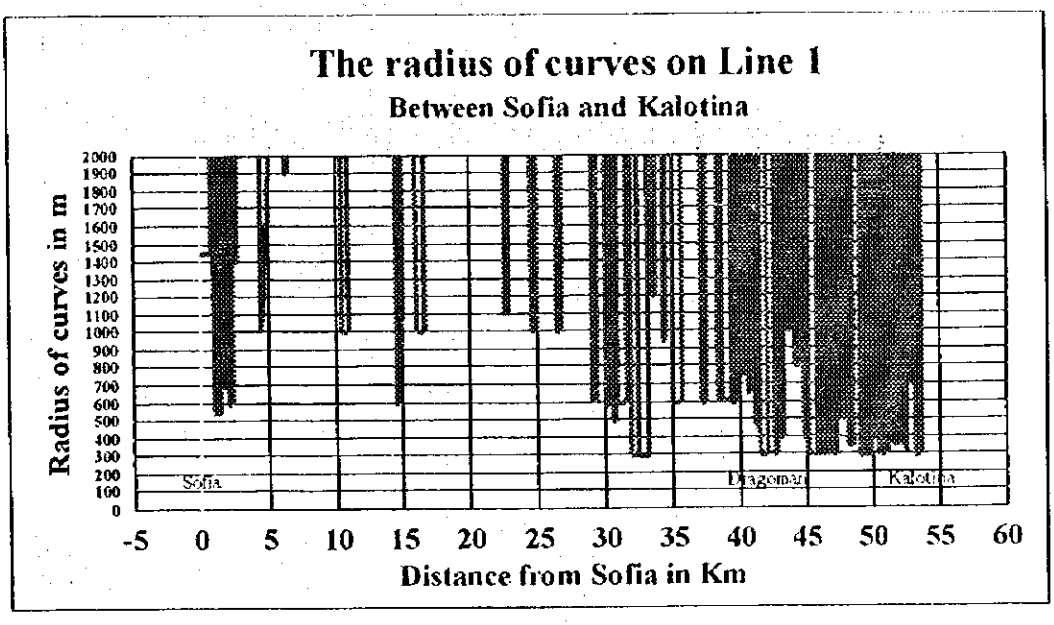
3. APPENDIX FOR TRAIN OPERATION PLAN OF CHAPTER 8.2

APPENDIX FOR THE ITEM 8.2.1

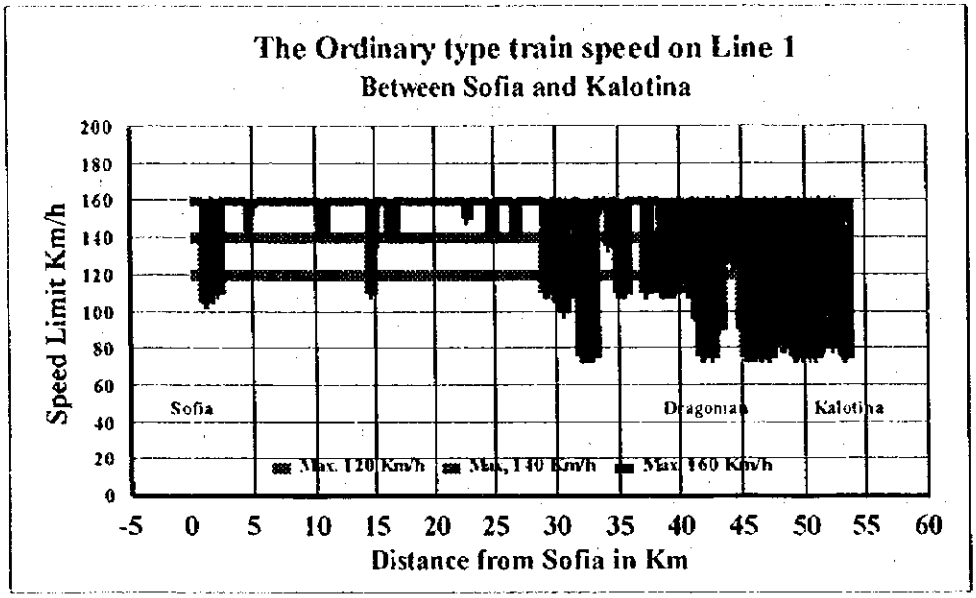


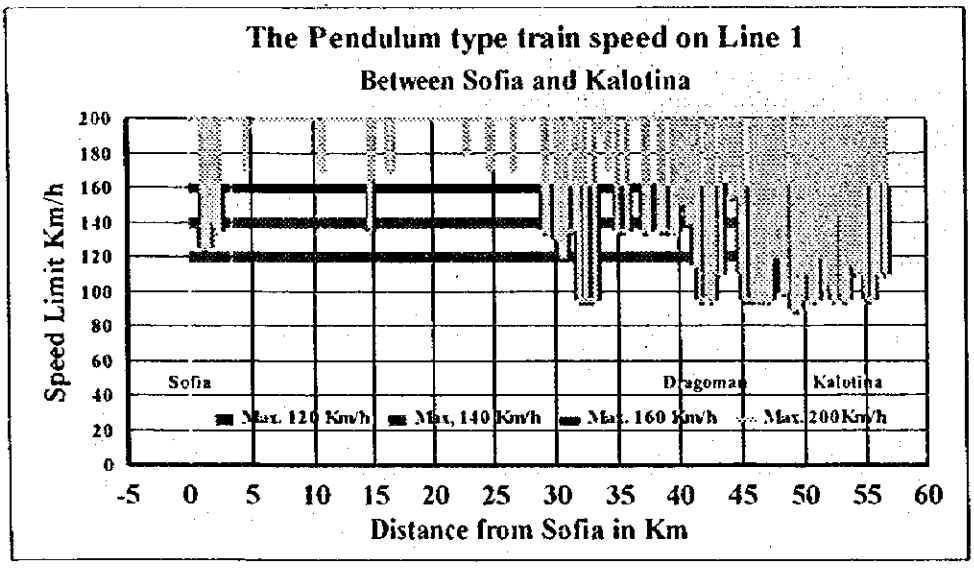
A-1 Figure of the track gradient between Sofia and Kalotina

The highest track level is about 740 m at Dragoman station. The gradient is maintaining down to Sofia and to Dimitrovgrad Yuz

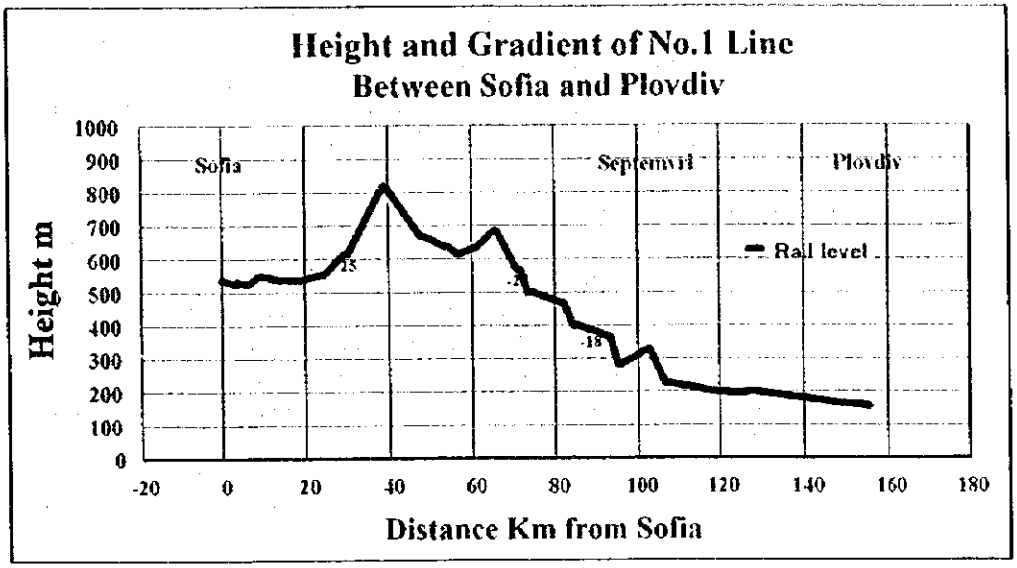


A-2 Curves between Sofia and Kalotina

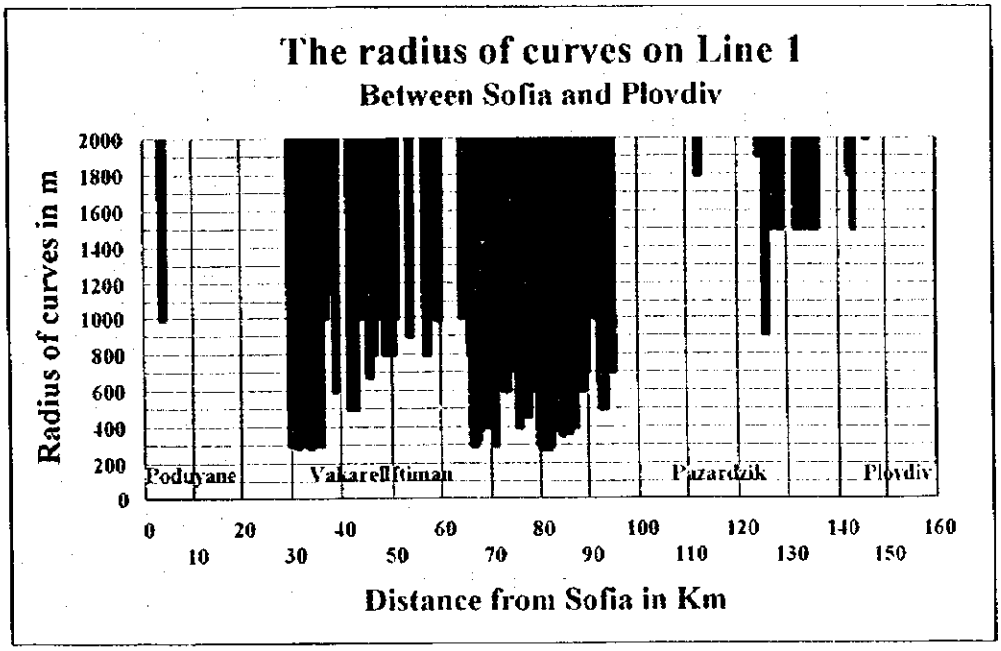




A-3 Curves and speed limit of ordinary and pendulum type train between Sofia and Kalotina

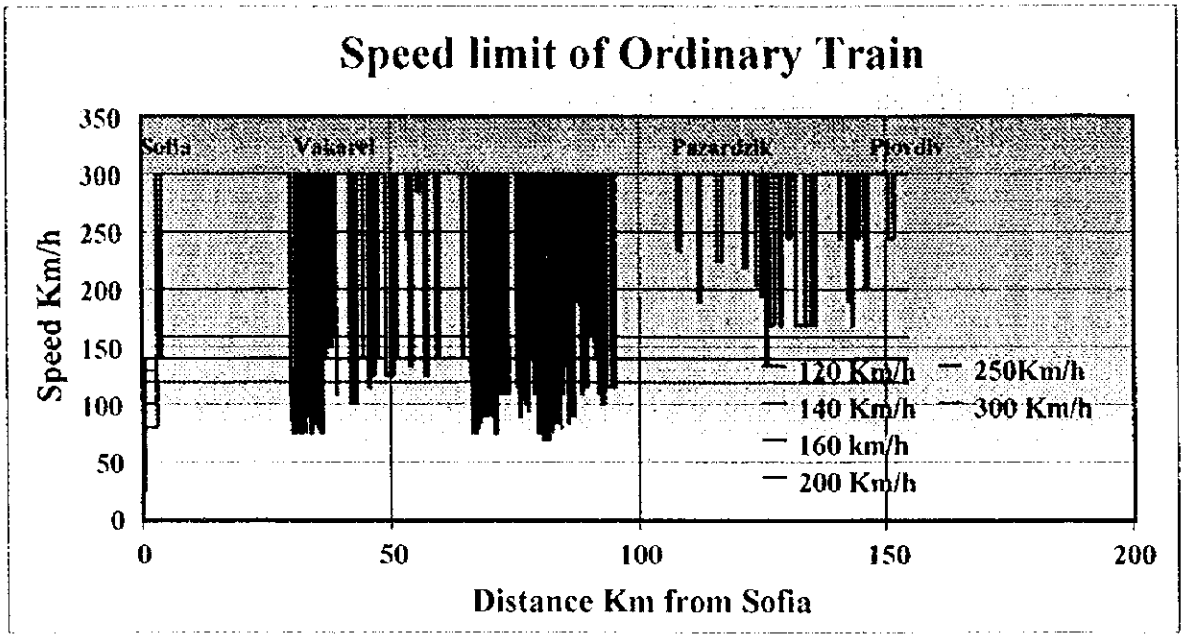


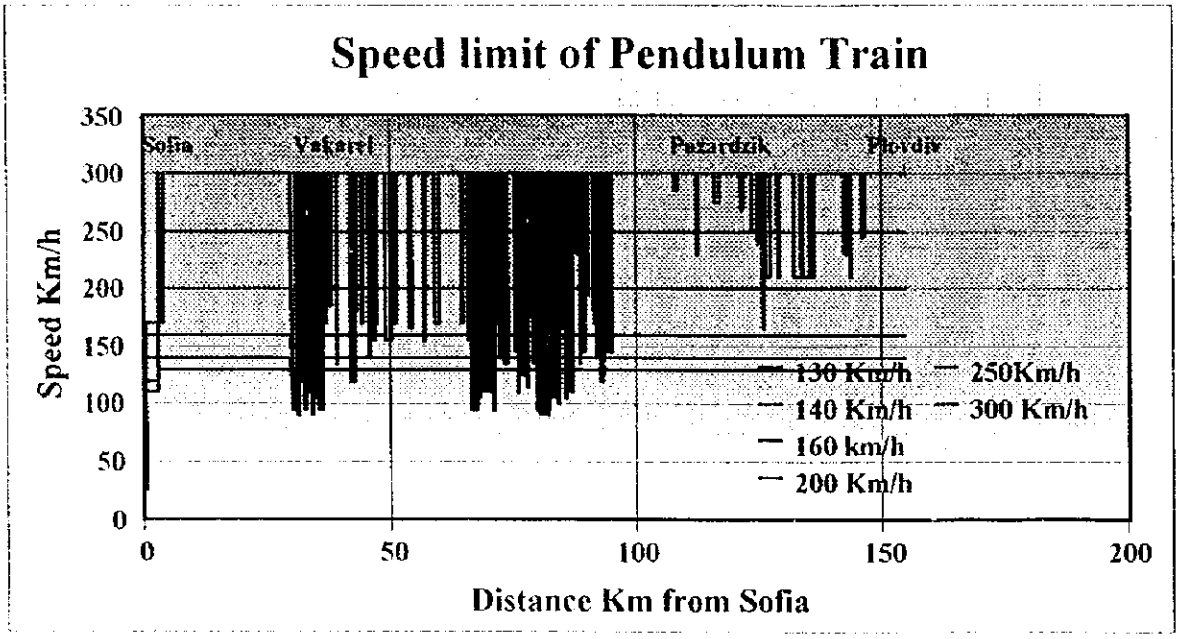
A-4 Figure of the track gradient between Sofia and Plovdiv



A-5 Curves between Sofia and Plovdiv

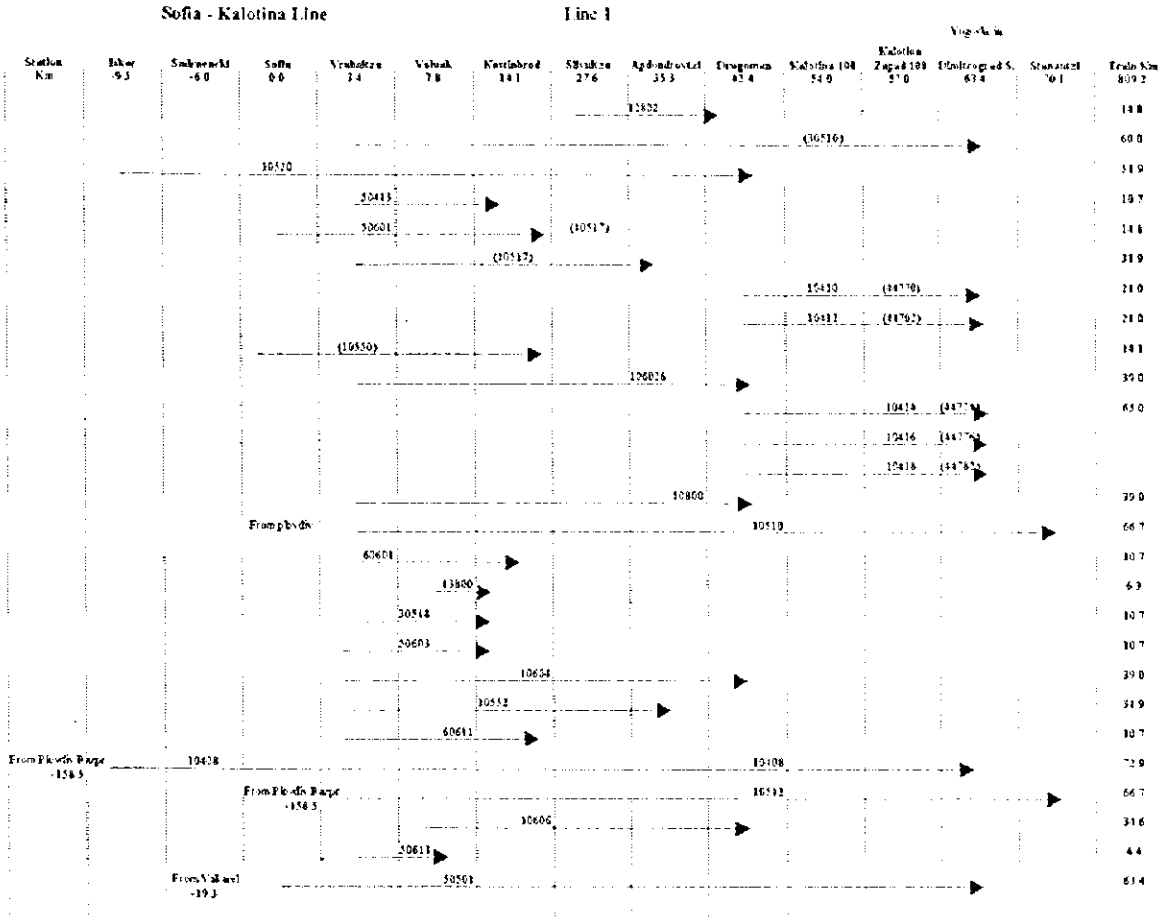
The sections of tight curves are admitted between 29 km and 95 km. The sections of 29-37 km and of 65-88 km are restricted by smallest curves of 300 m.



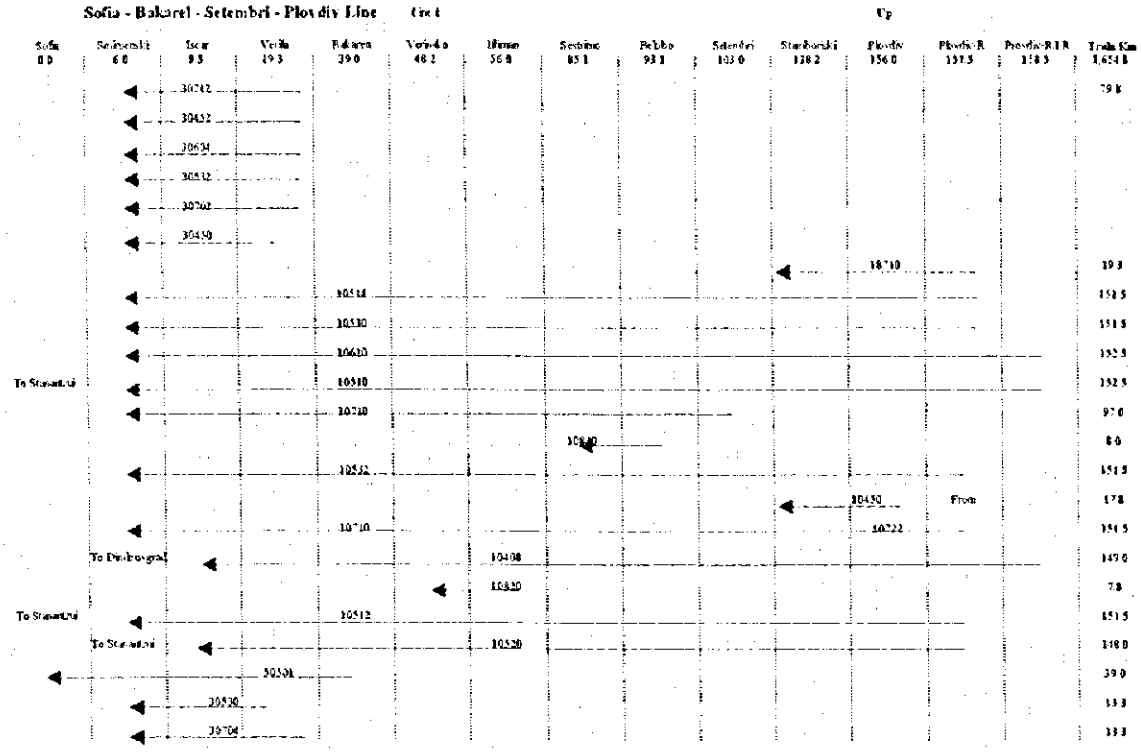


A-6 Curves and speed limit of ordinary and pendulum train between Sofia and Plovdiv

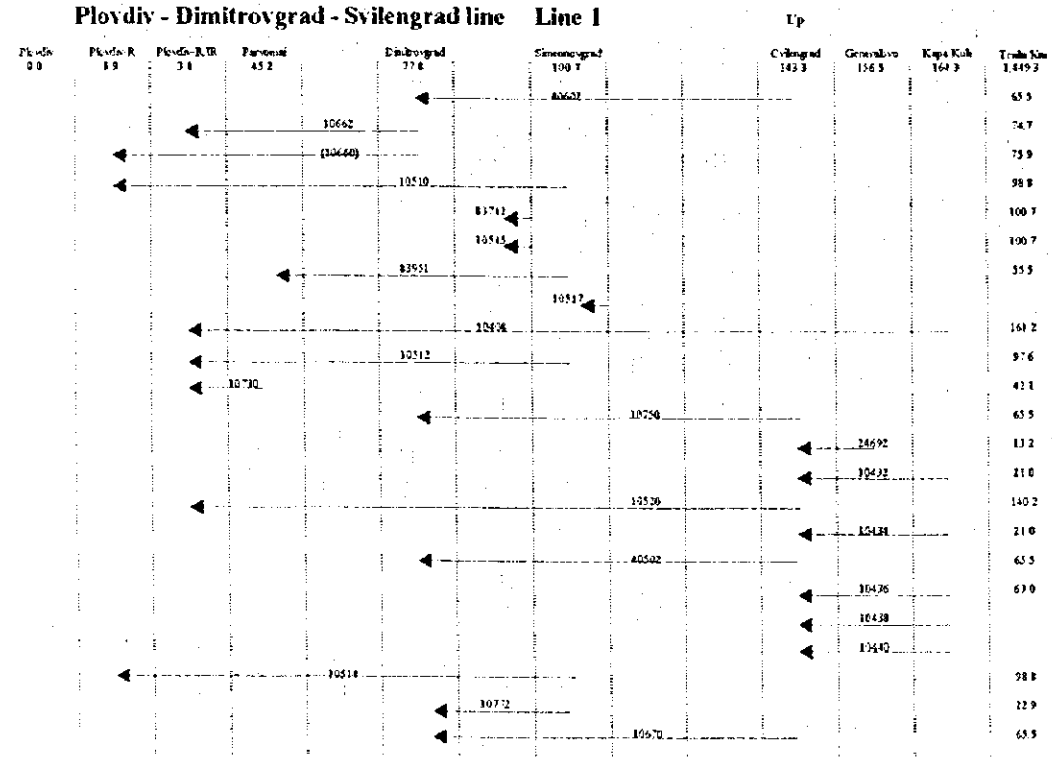
The track section between Sofia and Plovdiv is abundant of up and down gradient because of the existence of mountain range.



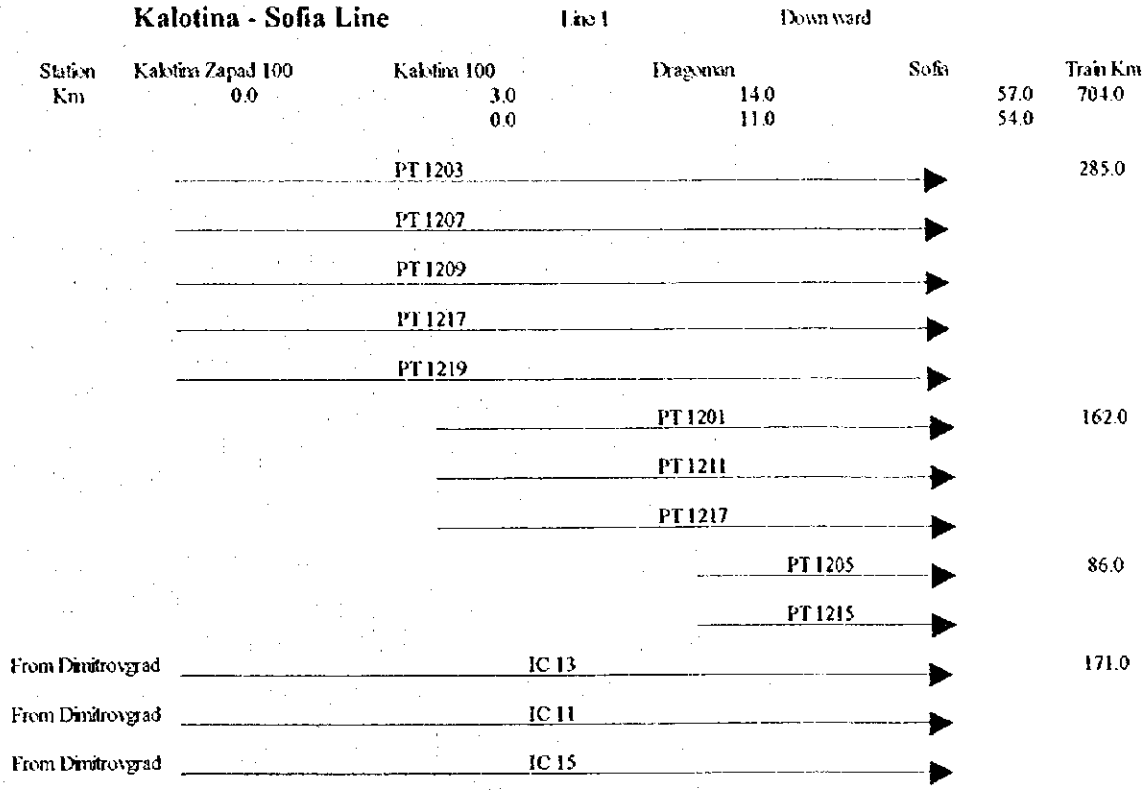
B-1: Bar Chart of Freight Train of Kalotina - Sofia



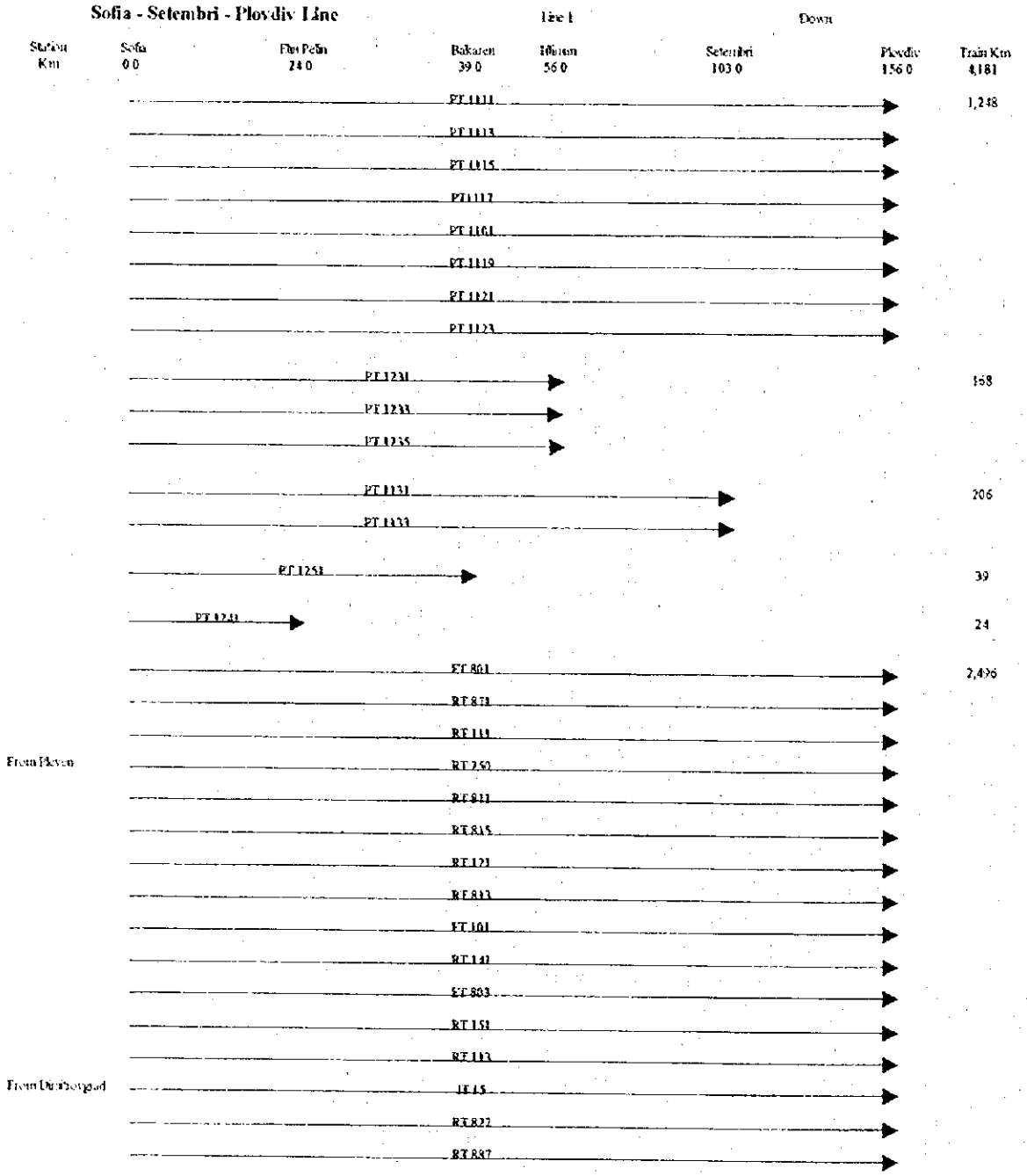
B-2: Bar Chart of Freight Train of Sofia – Plovdiv



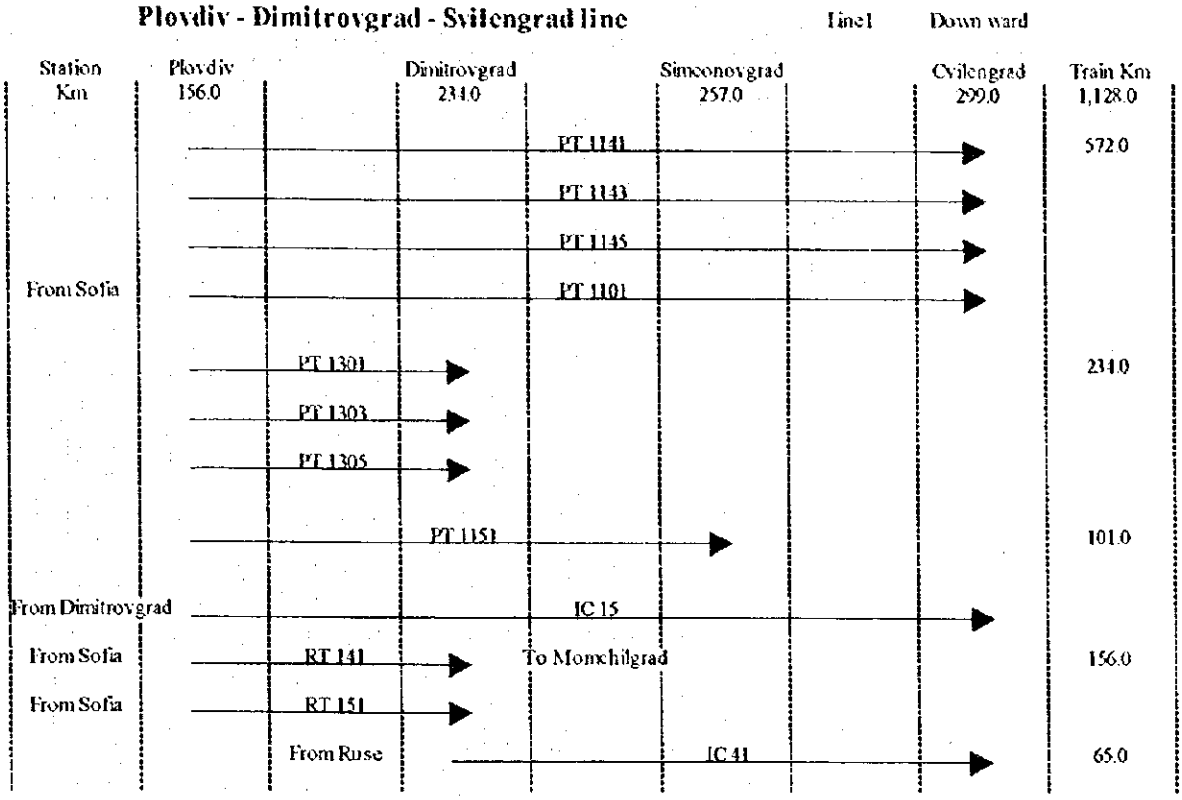
B-3: Bar Chart of Freight Train of Plovdiv – Svilengrad



C-1: Bar Chart of Passenger Trains between Sofia and Kalotina

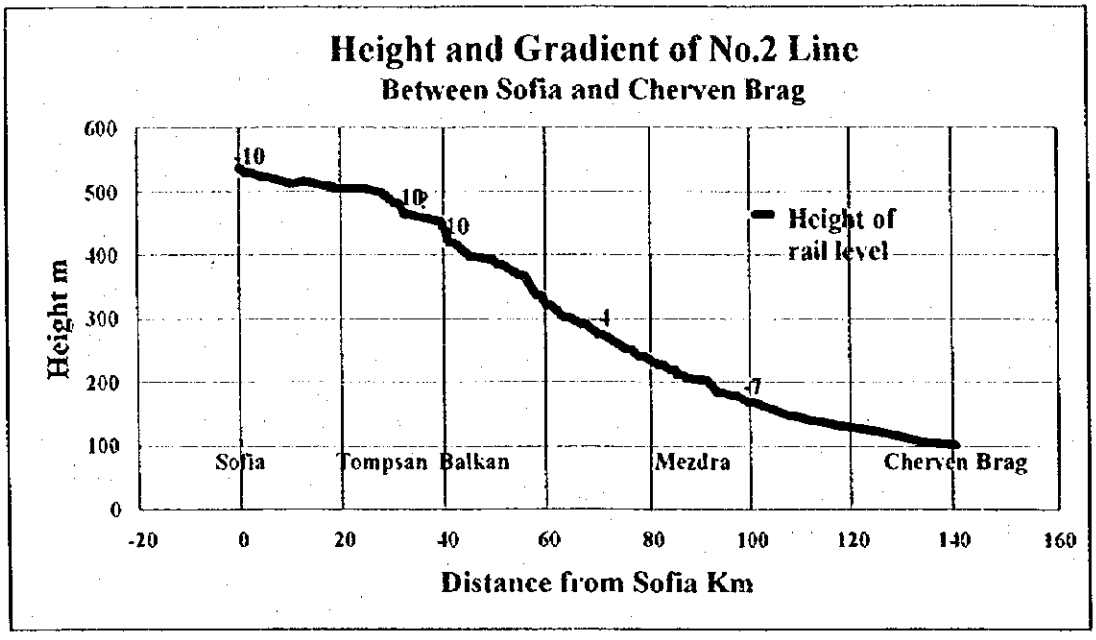


C-2: Bar Chart of Passenger Train between Sofia and Plovdiv

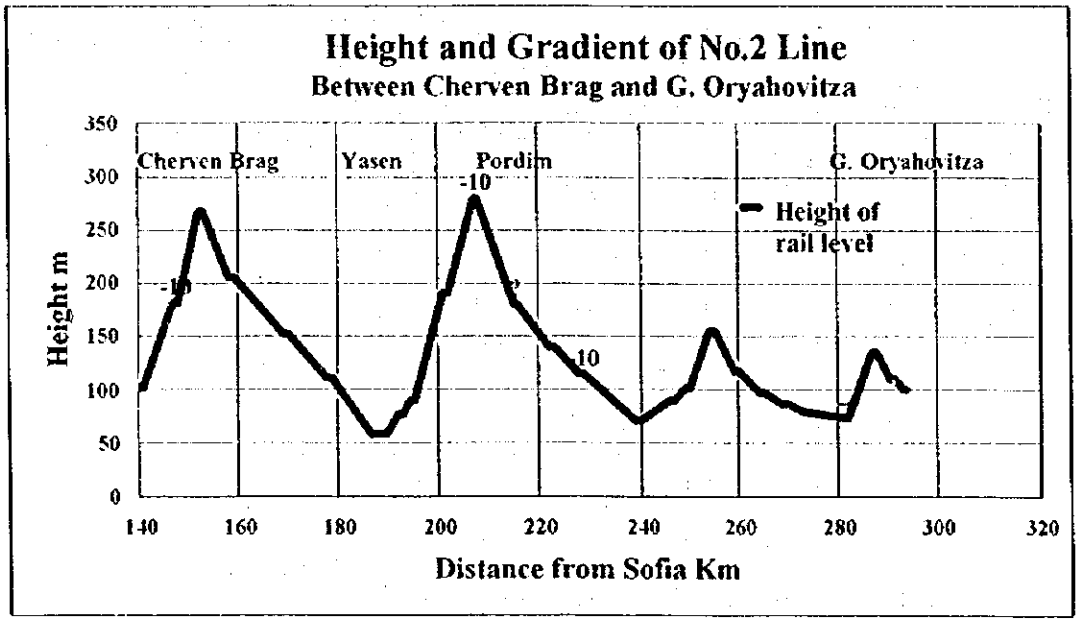


C-3: Bar Chart of Passenger Train between Plovdiv and Svilengrad

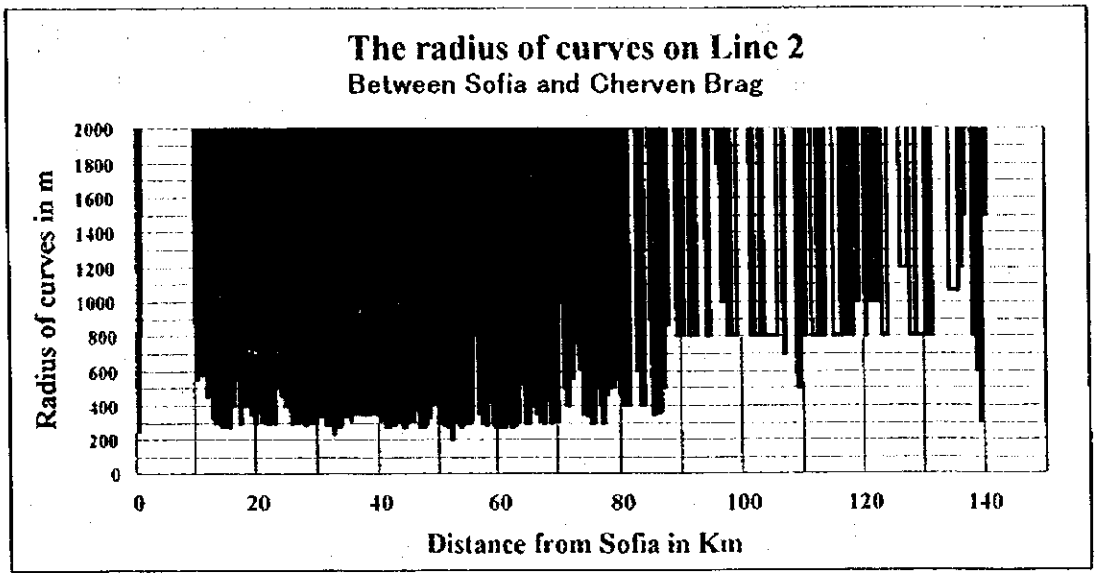
APPENDIX FOR THE ITEM 8.2.2



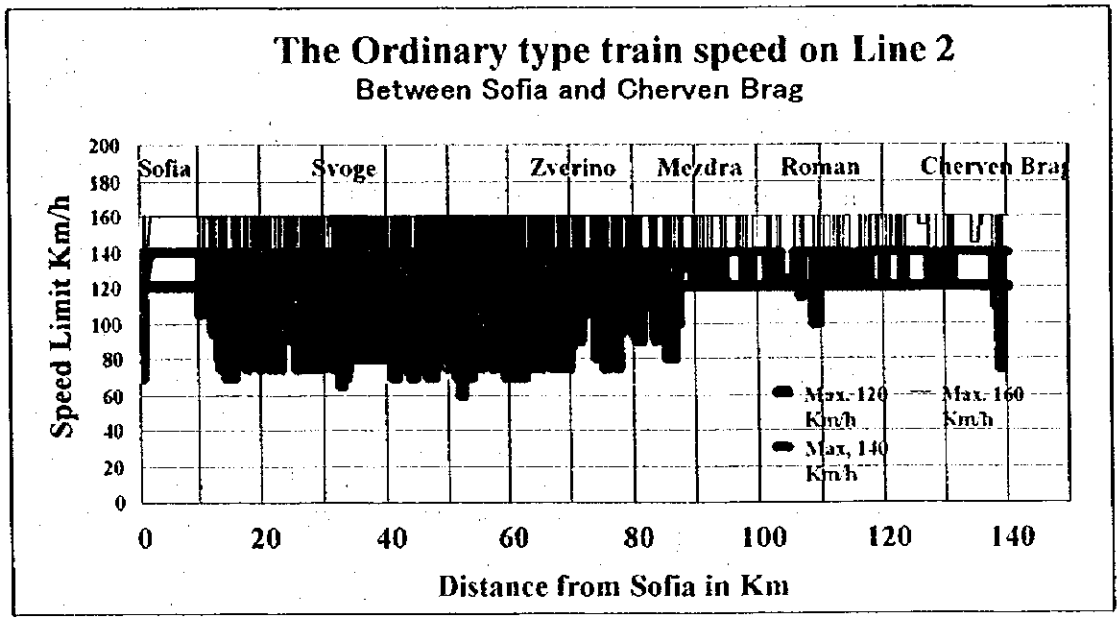
D-1: Figure of track gradient between Sofia and Cherven Brag



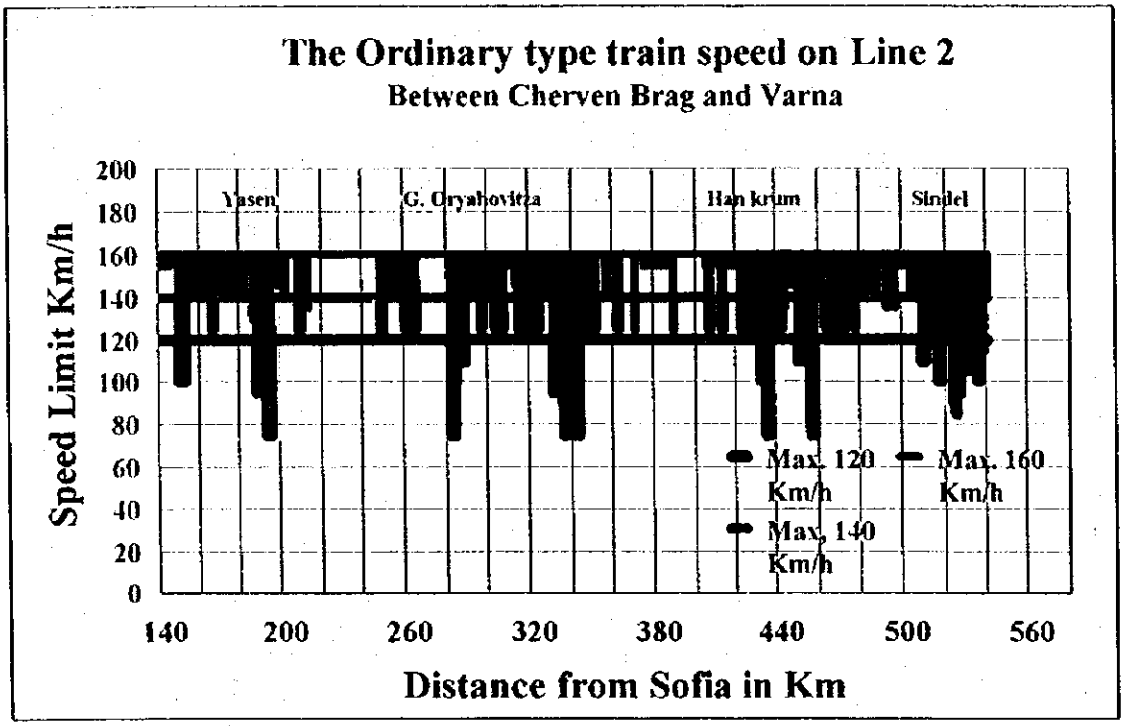
D-2: Figure of track gradient between Cherven Brag and G. Oryahovitza



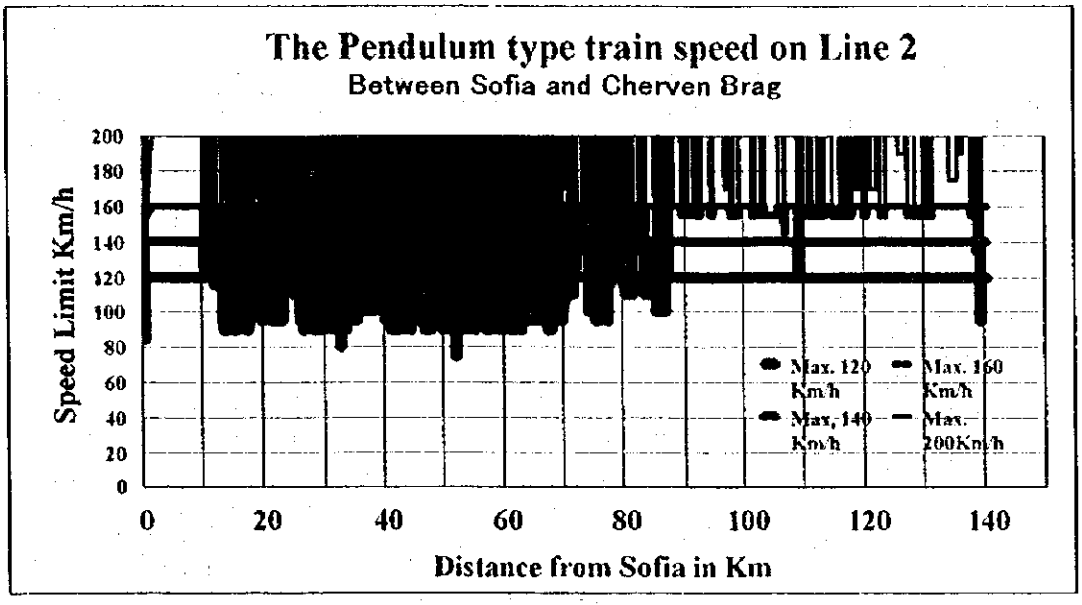
D-3: Curves between Sofia and Cherven Brag



D-4: Speed limit in case of ordinary type train between Sofia and Cherven Brag

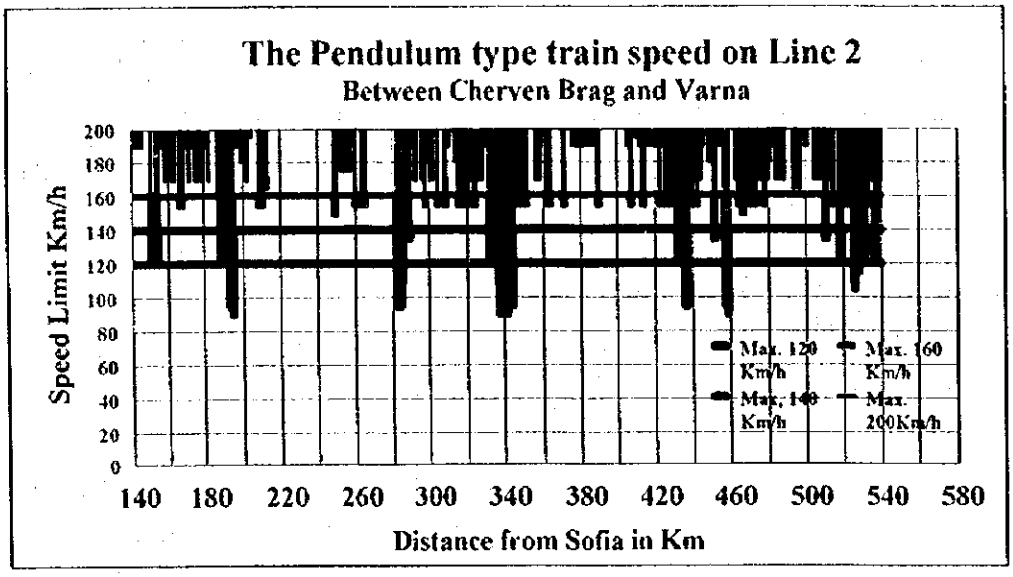


D-5: Speed limit in case of Ordinary type train between Cherven Brag and Varna



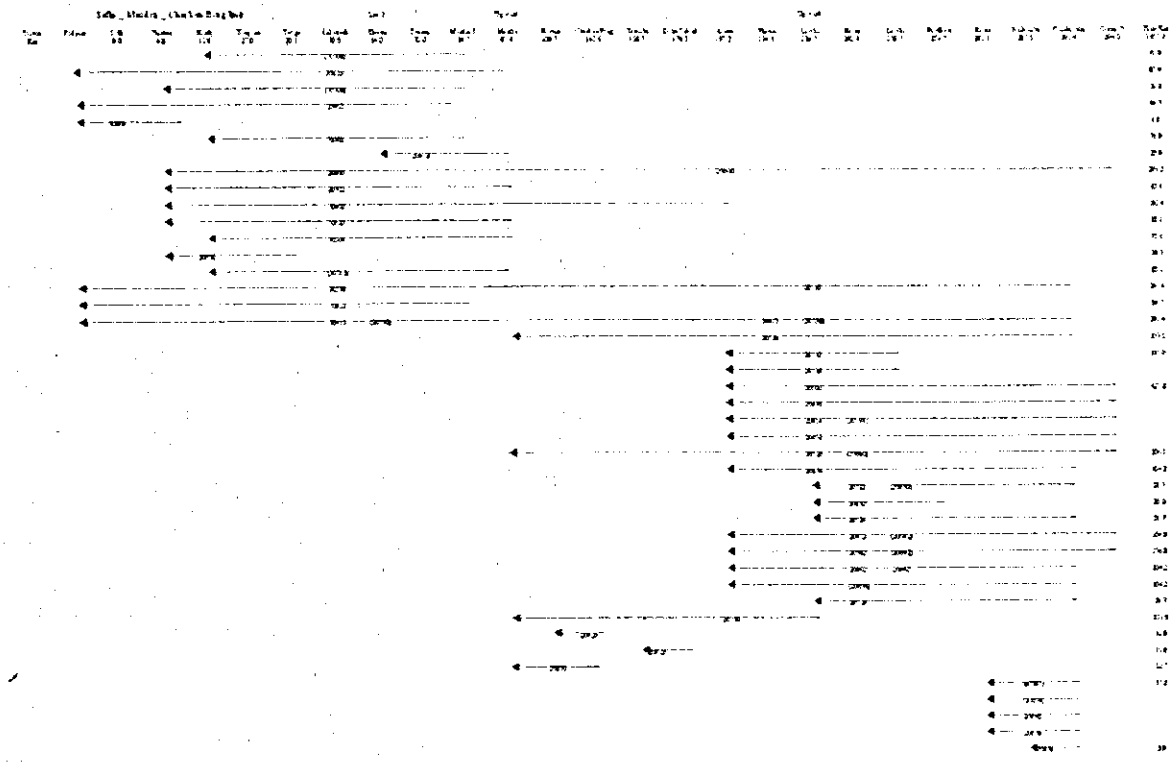
D-6: Speed limit in case of pendulum type train between Sofia and Cherven Brag

The speed limitation at major stations are giving fatal influence for increasing speed. By special project which will solve the limitation, big effect will be brought out for BDZ. The track figures of intermediate way between Cherven Brag and Varna can be used effectively for the future high speed operation.

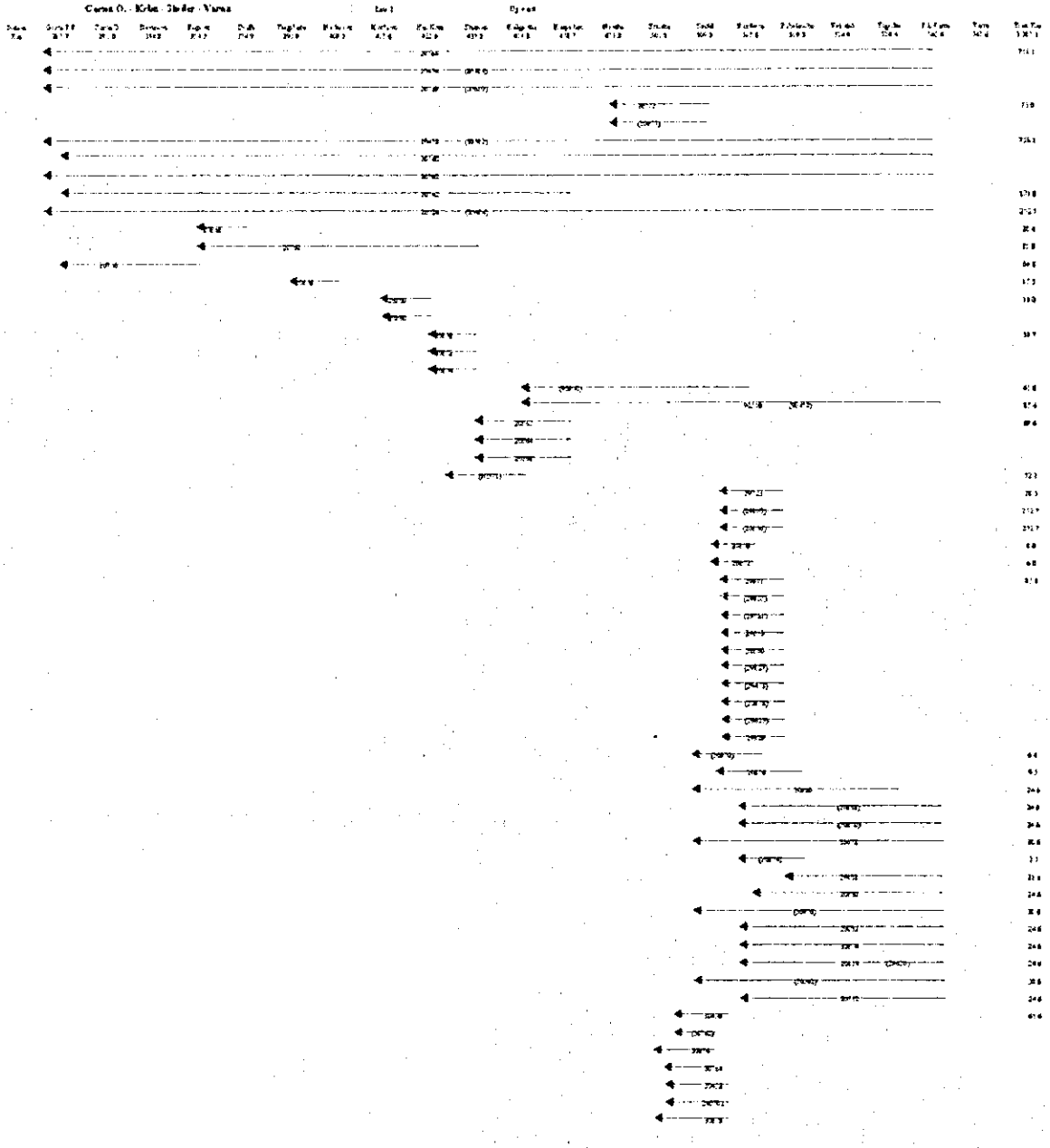


D-7: Speed limit of pendulum type train between Cherven Brag and Varna

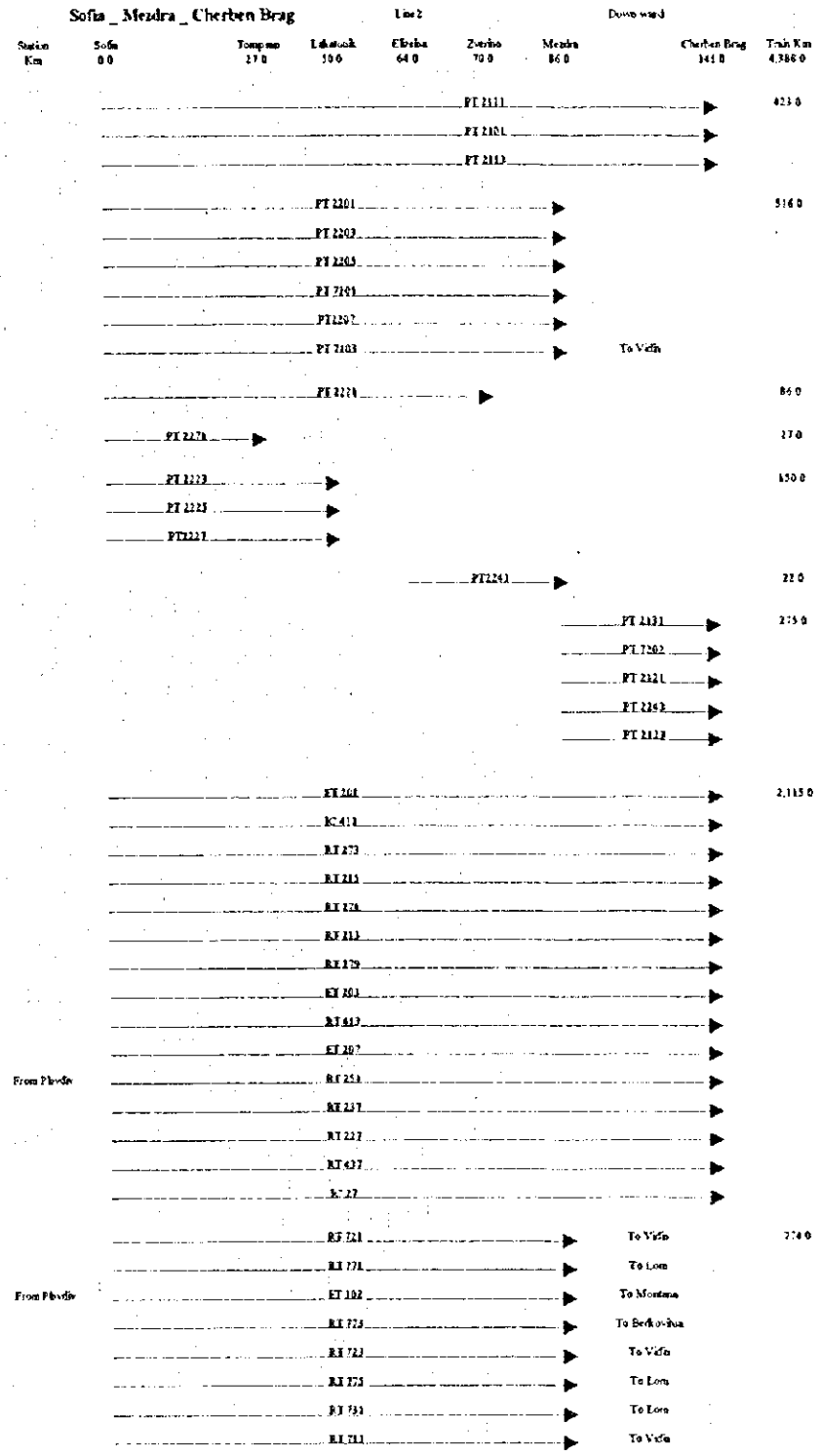
The 160 km/h pendulum train with light weight construction can run at maximum speed by improving the speed limit at the entrance and out going places of major stations. The capability of track figure of the BDZ will contribute to the future social activity of Bulgaria. The economical effect of speed up can be assumed through the example analysis which are done on the track between Sofia and Plovdiv.



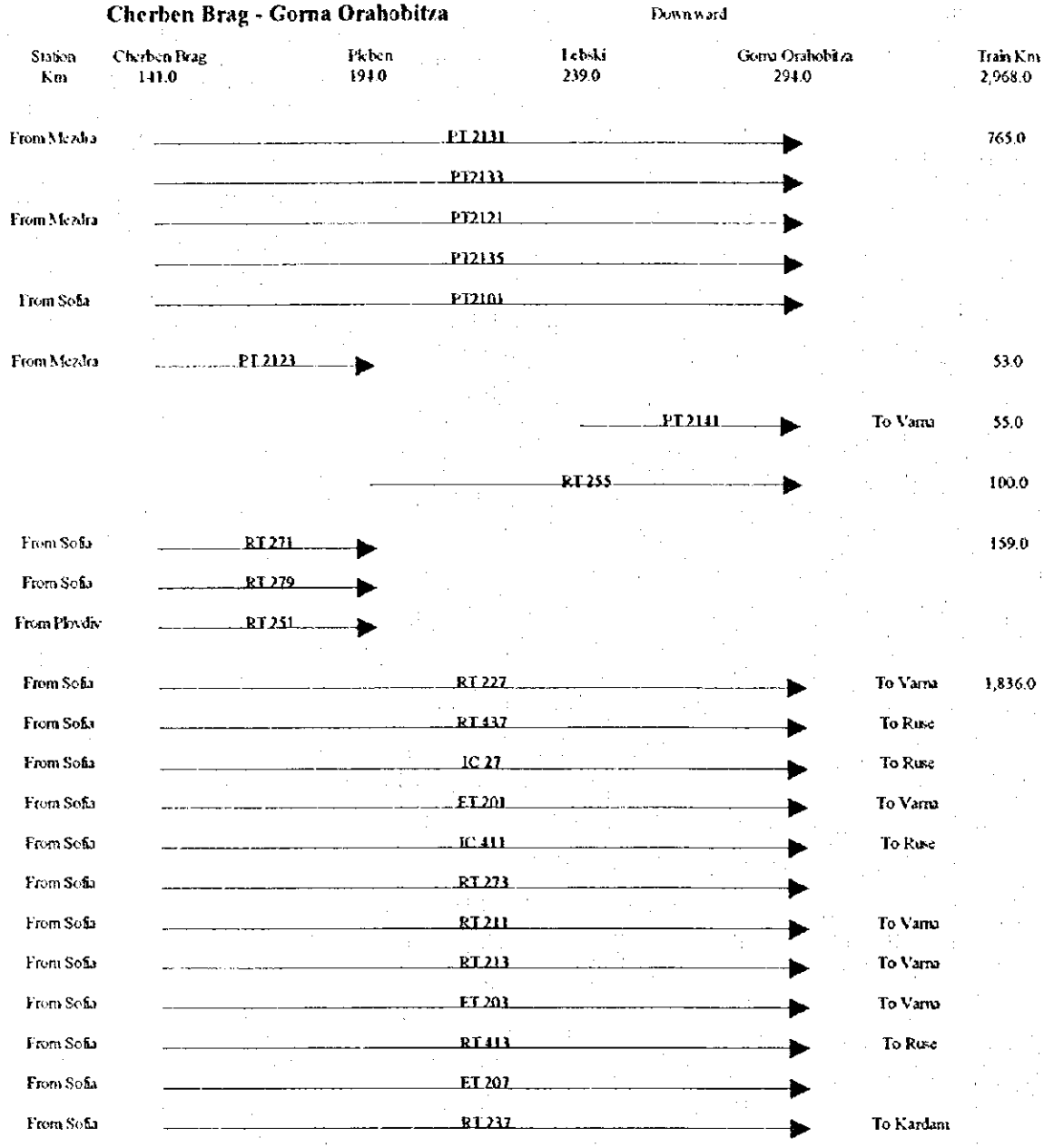
E-1: Bar chart of freight train of Sofia – Mezdra – Gorna Oryahovitza of No.2 line



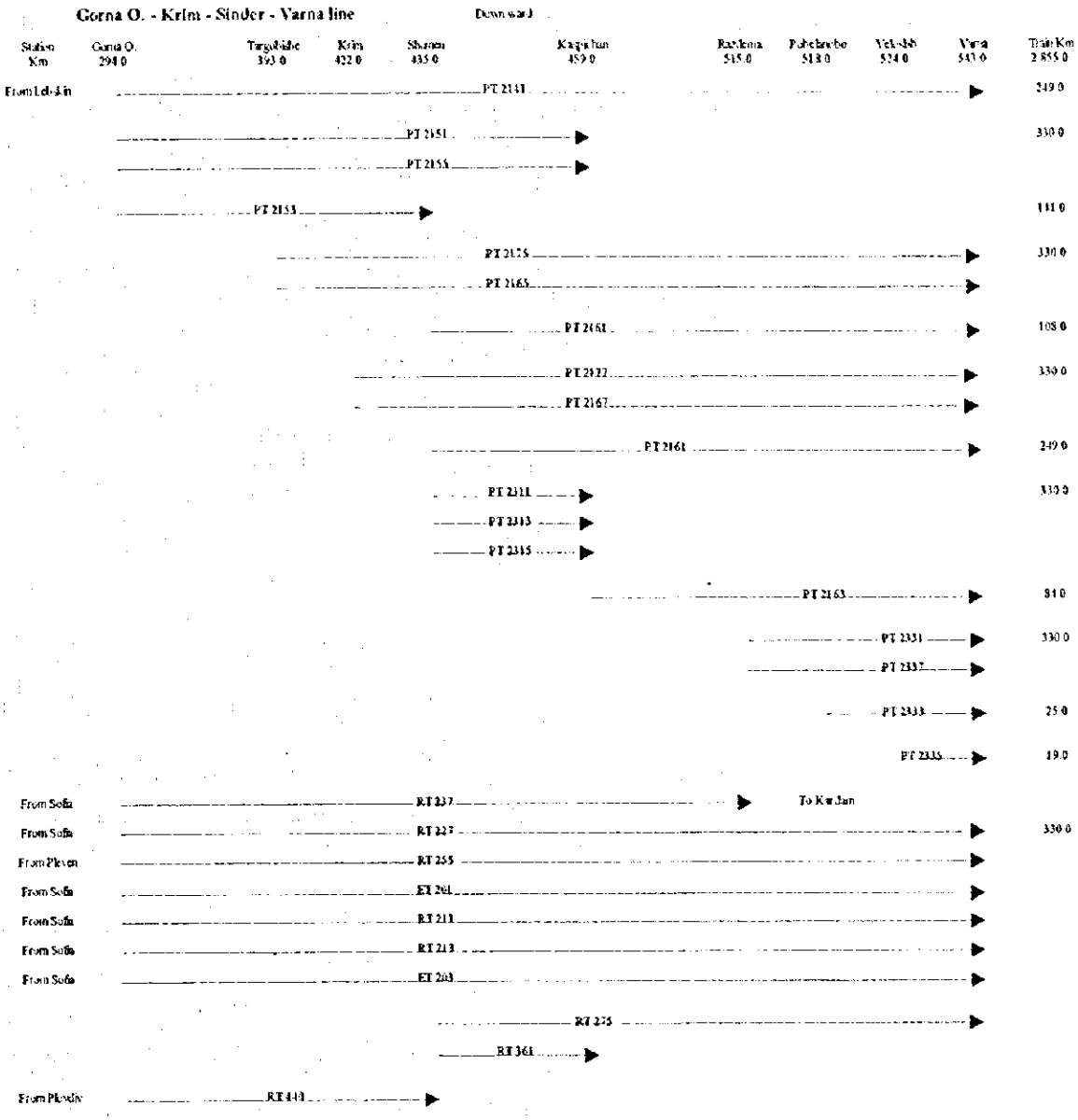
E-2: Bar chart of freight train of Gorna Oryahovitza - Varna of No.2 line



E-3: Bar chart of Passenger trains of Sofia – Cherven Brag of No.2 line

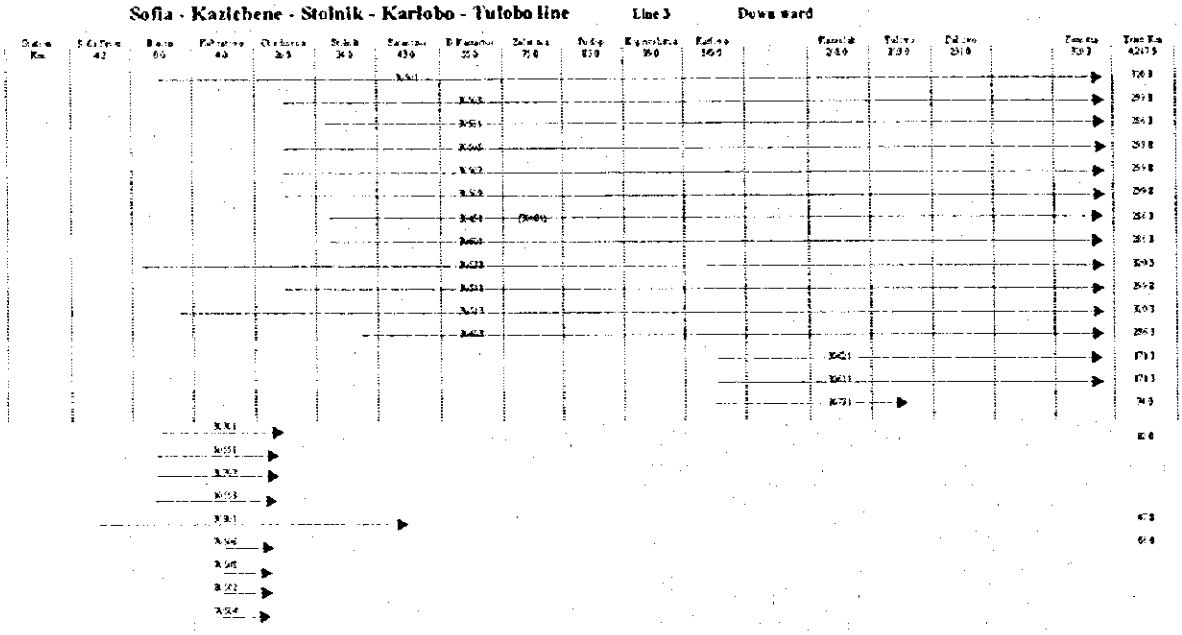


E-4: Bar chart of Passenger trains of Cherven Brag– G. Oryahovitza of No.2 line

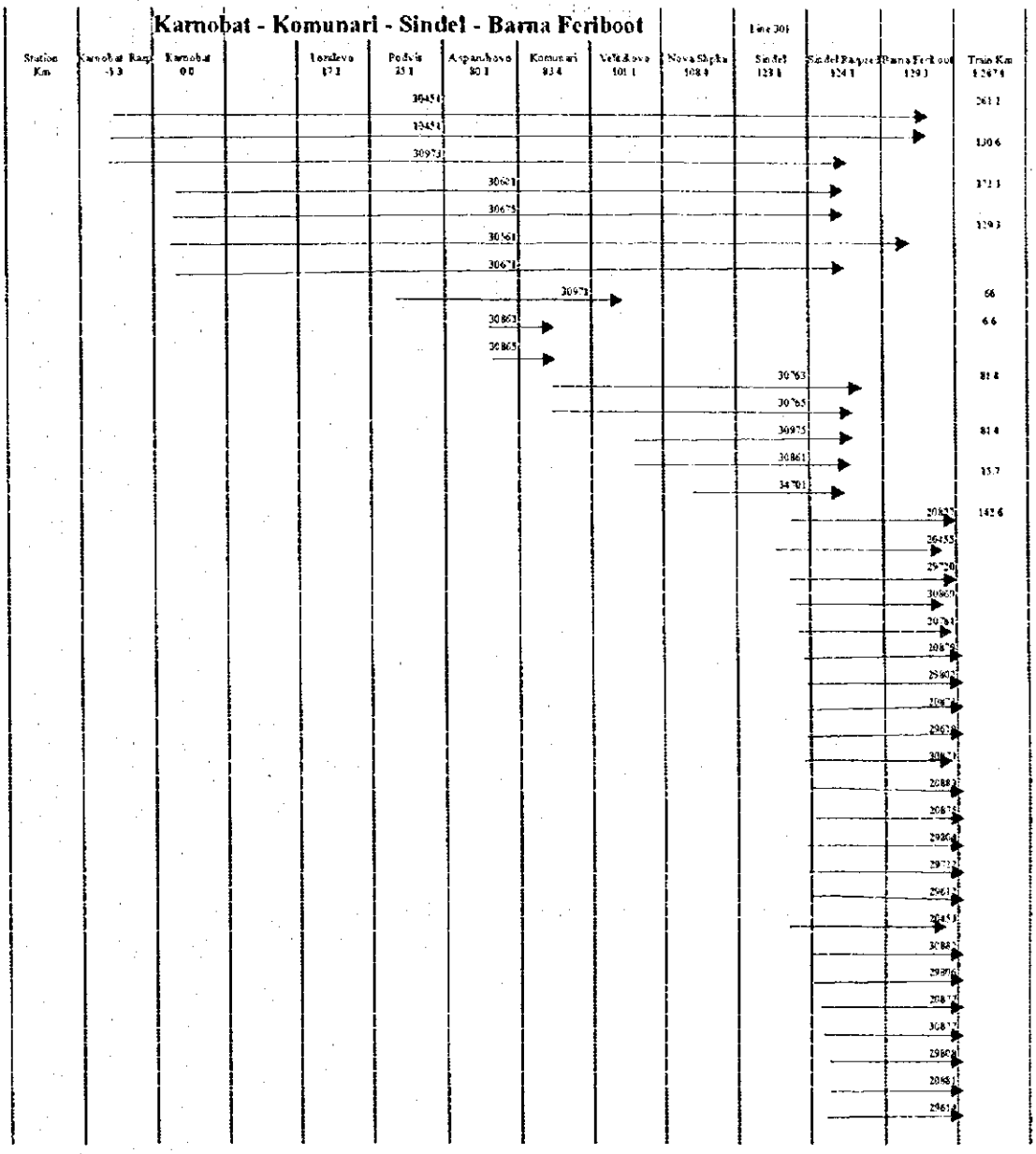


E-5: Bar chart of Passenger trains of G. Oryahovitza – Varna of No.2 line

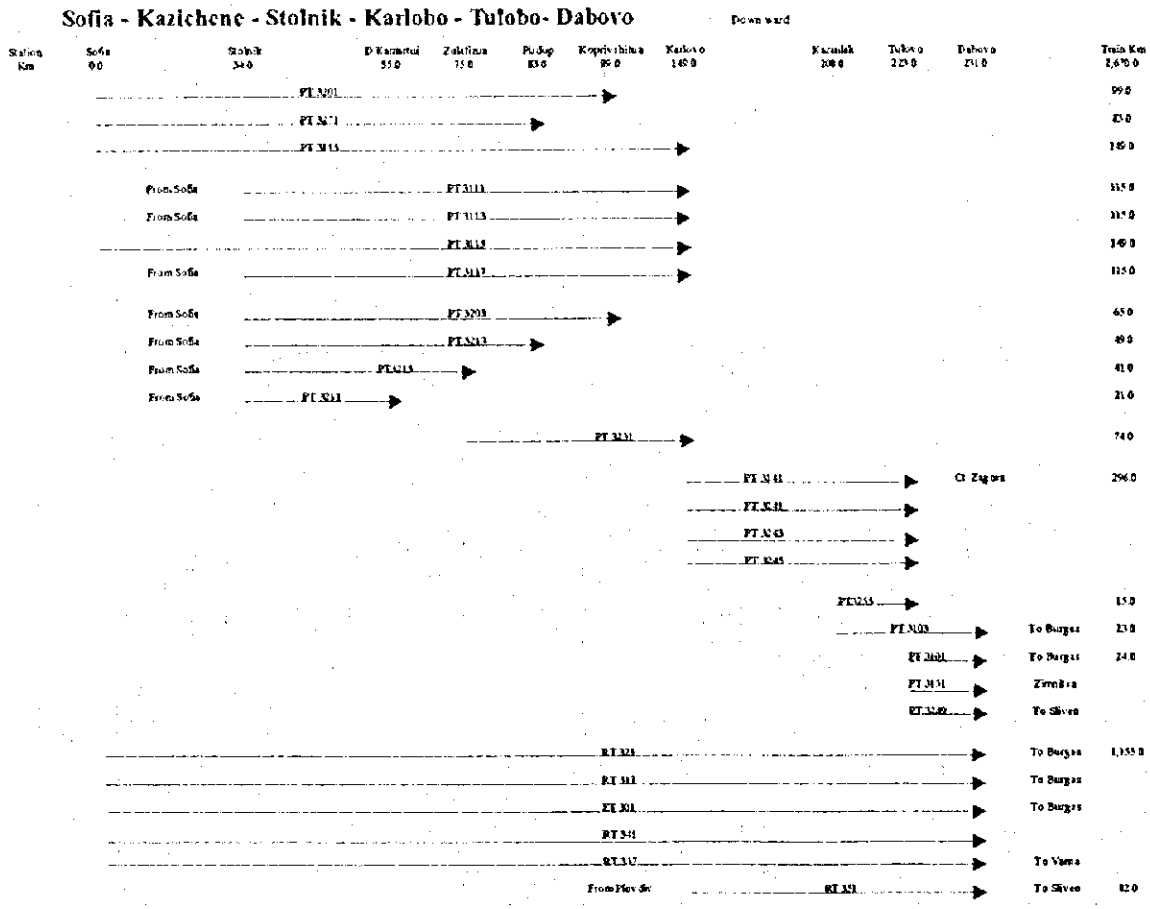
APPENDIX FOR ITEM 8.2.3



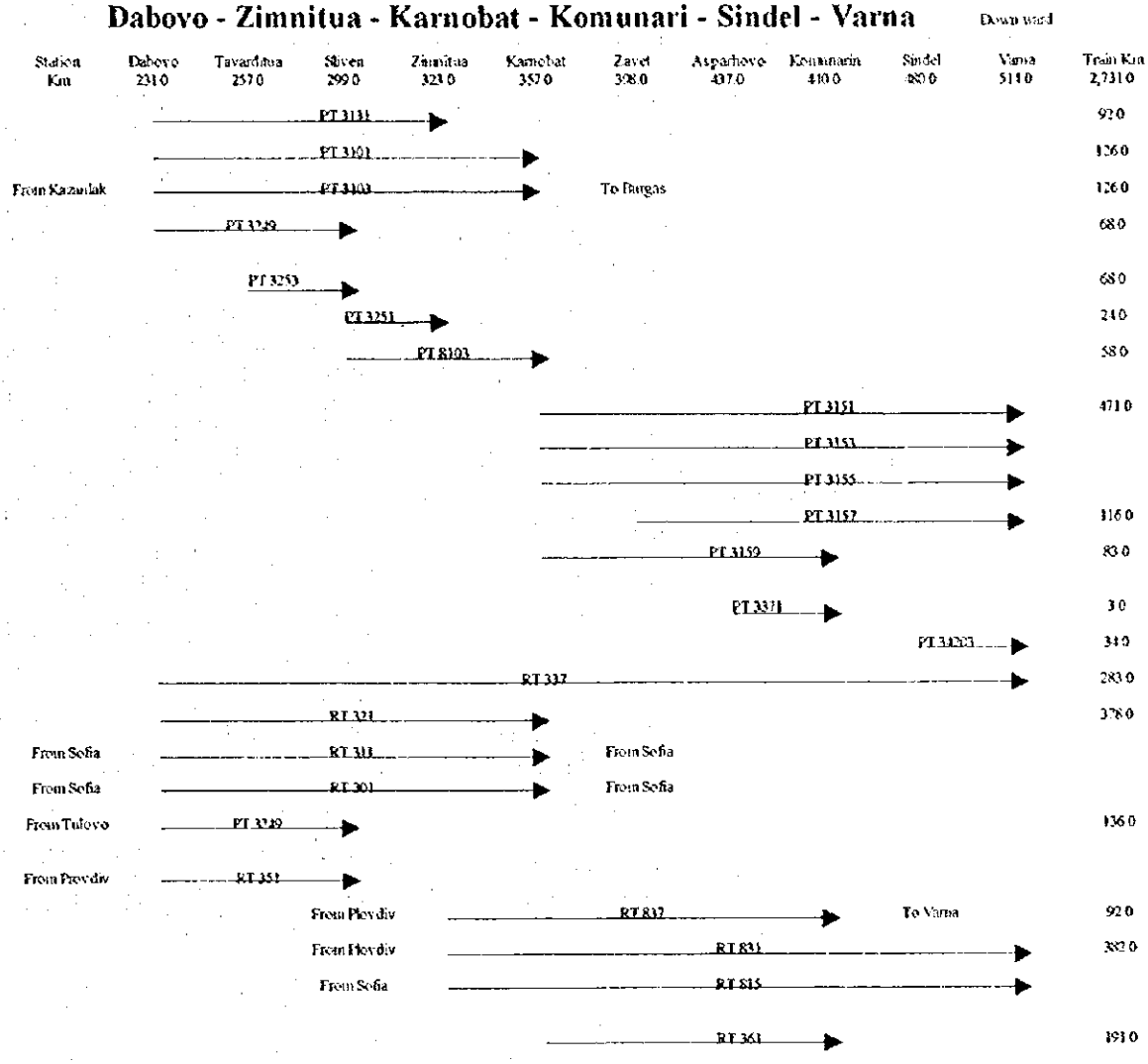
F-1: Bar Chart of Freight Train of No. 3 line between Sofia and Dabovo of No.2 line



F-2: Bar Chart of Freight Train of No.3 line between Dabovo and Varna of No.2 line



F-3: Bar chart of Passenger trains of Sofia – Dabovo of No.2 line



F-4: Bar chart of Passenger trains of Dabovo – Varna of No.2 line