KEN-BETWA LINK PROJECT

(PHASE - I)

FINAL EIA and EMP REPORT

Volume - I

8

RISK ASSESSMENT & DISASTER MANAGEMENT

NATIONAL WATER DEVELOPMENT AGENCY
(Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India)

AFC INDIA Ltd.

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RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

8.1 INTRODUCTION

While occurrence of natural disaster cannot be prevented altogether, their adverse impact can be reduced substantially by undertaking various preparedness and mitigation measures. Minimizing the loss of precious human life is the first priority in disaster management. It is important therefore, to prepare for such a crisis. It has been realized that preparedness is essential for proper and timely execution of post-disaster operations.

This chapter discusses various aspects concerning preparedness to face disasters with a view to minimizing losses to men and material besides measures to mitigate the impact of disaster. It attempts to focus the various issues specially pertaining to disasters like fire and breakdown of the dam, unprecedented floods and other hazards identified under disaster assessment, besides recommending necessary measures. The study stresses the need for all efforts in this direction. In the following pages we shall look in greater detail at some of the measures and rationale underlying their adoption in disaster situations. Before taking up the risk of various disasters likely in Ken-Betwa Link Project Phase-I area and their management an attempt has been made in this chapter to describe the distinction between disaster prevention and preparedness.

Planners and decision makers have recognized a need for better understanding the social consequence of projects, programs and policies. An attempt is also made in this chapter to undertake Social Impact Assessment of the project. An attempt is also made in this Chapter to narrate the process of Public Consultation and document the outcome of such Public Consultation. Thus, this Chapter is divided in to three sections. They are as follows:

- Risk Assessment and Disaster Management Plan;
- Social Impact Assessment of the Project and R&R Action Plan; and
- Process and Outcome of Public Consultation

8.2 RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

In this section an attempt is made to give details regarding disaster preparedness and prevention, identification of various types of disaster likely to occur in the project area and prepare a disaster management plan for preparedness and mitigation of after effects of a disaster.

8.2.1 Disaster Preparedness and Prevention

The UN Disaster Relief Office (UNDRO) uses the following definition of the two terms viz., disaster preparedness and prevention.
"Disaster Preparedness may be described as measures to organize and facilitate timely and effective response, relief, and rehabilitation operations in cases of disaster. Measures of preparedness include, among others, setting up disaster relief machinery, formulation of emergency plans, training of specific groups with responsibility for response and relief, stockpiling supplies and earmarking funds for relief operations. Prevention and mitigation are used as synonyms. Mitigation means to reduce the severity of the human and material damage caused by the disaster. Prevention is to ensure the human action or natural phenomena do not result in disaster and emergence. The objective of disaster prevention is to avoid such situations as far as possible".

In general, therefore, prevention is concerned with long-term aspects, policies, and programs to prevent or eliminate the occurrence of disasters. Preparedness, on the other hand, covers the short-term aspects and is designed to include the action necessary during the approach of a possible disaster, during the existence of a disaster situation and in the ensuing period devoted to relief and rehabilitation. One is concerned with risk elimination, the other with risk mitigation. Disaster Prevention depends on the application of science and technology to prevent disasters whereas preparedness is concerned and conceived of in short-term, organizational and technical terms. From a practical standpoint the distinction is very important; for, the essential logistical and organizational measures that constitute disaster preparedness can be undertaken in a relatively short span of time. Prevention measures often involve weighty decisions and measures of public policy such as resettlement of whole communities, or legislation on zoning.

From the point of view of disaster preparedness, it is useful to classify disasters according to their predictability. The more predictable a disaster the easier it is to plan safety and precautionary measures. Some disasters are not predictable at all. Earthquakes and tornadoes fall in this category. The best that can be done in such circumstances is to arrange rescue, relief, and rehabilitation measures speedily following their occurrence. Cyclones can be predicted with a reasonable degree of accuracy about 24 to 48 hours before they hit the coast.

A major constraint in relief operations is finance. Since the Second Finance Commission, every state has been annually earmarked a specific amount for funds known as the 'Margin Money' for meeting the immediate requirements of relief. The Tenth Finance Commission recommends the constitution of a Calamity Relief Funds (CRF), with contribution of Centre and States in the proportion of 75 and 25 per cent respectively. The Commission also suggested that in addition to CILFs for states, on National Fund for Calamity Relief (NFCR) should be created to which the centre and states would subscribe and which will be managed by a national calamity relief

committee on which both the centre and the states would be represented. The Finance Commission hoped that with the setting up of the NFCR, it would be possible to tackle calamities of some severity more effectively.

While no degree of human ingenuity can prevent the occurrence of cyclones, it is possible to devise ways to mitigate the damage and suffering caused by taking appropriate measures. These measures broadly include the following:

1. Reliable warning services for detection of the cyclone storm;
2. Rapid dissemination of weather warming to concerned officials and general public and;
3. Machinery for the evacuation of people and also movable property to suitable shelters.

The Government of Madhya Pradesh (GoMP) recognizes the need to have a proactive, comprehensive, and sustained approach to disaster management to reduce the detrimental effects of disasters on overall socio-economic development of the state. GoMP believes that there is a need for a policy that articulates its vision and strategy for disaster management in the state. In this context the Madhya Pradesh State Disaster Management Authority (MPSDMA) provides guidelines to various entities involved in disaster management in the state to discharge their responsibilities more effectively[1].

8.2.2 Likely Disasters in Project Area

The main hazards in the Ken-Betwa Link Project Phase-I area may occur due to dam break and catching of fires because of explosions, chemicals or gasses. The objective of the major emergency or disaster management plan is to make use of the combined resources of the project proponents and the outside services to achieve the following tasks:

⇒ Effect the rescue and medical treatment of causalities;
⇒ Safeguard other people;
⇒ Minimise damage to property and the environment;
⇒ Initially contain and ultimately bring the incident under control;
⇒ Identify any causalities;
⇒ Provide the need of relatives ;
⇒ Provide authoritative information to the news media;
⇒ Secure the safe rehabilitation of affected area;
⇒ Preserve relevant records and equipment for the subsequent enquiry into the cause & circumstances of the emergency.

[1] See **Madhya Pradesh State Disaster Management Policy**, (Bhopal: Madhya Pradesh State Disaster Management Authority), p. 1

This likely disasters and necessary preventive measures to control disasters in the project area are discussed in the following paragraphs.

8.2.3 Dam Break Analysis and Disaster Management

Dam break analysis has been prepared based on the report provided by the National Institute of Hydrology, Rourkee. Dam failures are often caused by overtopping of the dam due to inadequate spillway capacity during large inflow to the reservoir from heavy precipitation generated runoff. Dam failures may also be caused by seepage or piping through the dam or along internal conduits, slope embankment slides, earthquake damage and liquefaction of earthen dams from earthquake and land slide generated waves in the reservoir. Usually the response time available for warning is much shorter than for precipitation –runoff floods. The protection and evacuation of the public from the consequences of dam failures has taken an increasing importance as population has concentrated in areas vulnerable to dam break disasters.

Occurrence of a series of dam failures has increasingly focused attention of scientific workers on the need for developing generally applicable models and methods to evaluate flash floods due to dam failure and for routing them through downstream areas, susceptible to heavy losses, so that potential hazards might be evaluated. Using these methods, inundated areas, flow depths and flow velocities can be estimated for different hypothetical dam failure situations. With the help of such studies, it could be possible to issue warnings to the downstream public and prepare strategies for disaster management when there is a failure of dam. The main difficulty in using such mathematical models is the failure description adopted in the model. Under these circumstances, a suitable assumption with regard to the adjustment of actual failure mode to suit the model failure mode is necessary.

8.2.3.1 Methodology

In this study, the popular NWS-DAMBRK developed by National Weather Services (NWS) model was used for investigations of the flood wave propagation characteristics in the considered river reach, i.e., 11.4 km upstream of the Daudhan dam and 157 km downstream of the dam. The model is founded on the following functional parts:

- Description of the dam failure model;
- Computation of outflow hydrograph through the breach as affected by the breach description, reservoir storage characteristics , spillway outflows and downstream tail water elevations; and
- Routing of the outflow hydrograph through the downstream valley in order to determine the change in the hydrograph due to valley storage, frictional resistance, downstream bridges or dams, and to determine the resulting water surface elevations and flood wave travel time.

This models inheres the following assumptions in its formulation:

1. Cross sections in the downstream channel are oriented perpendicular to the flow so that the water surface is horizontal across the section.
2. The channel boundaries are rigid, i.e., cross sections do not change their shape due to scour or deposition.
3. The pool elevation at which breaching begins, rate of breach development, and shape and size of the breach must be supplied by the user.

The NWS-DAMBRK model was employed for the proposed Daudhan Reservoir to evaluate the flood wave propagation characteristics for the three cases:

Case 1: Dam break hydrograph generation with PMF as inflow
Case 2: Routing of PMF through the reach considering that no dam exists
Case 3: Routing of PMF through the reach considering that there is a dam, but it never fails

The maximum water surface elevations computed in all the above DAMBRK runs for all the above three Cases were seen to closely follow the trend of river bed profile. Secondly, the water surface elevations attained in Case-1 were the highest of all the three cases. It is consistent with the expectation that the Case-1 represents the worst case leading to dam failure. In Case 3, the elevations were lower than those in Case 1 as the releases was too high to build up the storage in the reservoir. The water surface elevations reached in PMF wave propagation, i.e., dam exists but never fails, were the lowest of all at all the cross-sections in the whole study in river morphology analysis, the consideration of sediment concentration in the river flow plays a significant role to affect the river bed, its banks, and the process of meandering and its related aspects. The upper reaches of Ken River are flanked by undulating plateau with sandstone, shale and limestone, indicating the reach to be of sufficiently hard bed-rock to exhibit its degradation / scour. It is learnt that the river bed is not amenable to degradation due to short-term high river flows. In most part of the reach the river is confined by stable banks which are not amenable to erosion / shifting. Almost straight reach of the river suggested the absence or unlikelihood of the meandering to take place and, therefore, the formation of cutoff due to high river flows was beyond conceptualization. Considering these aspects, it can be concluded that the construction of the dam and regulation of stream flow by the Daudhan reservoir are not likely to cause significant adverse morphological changes in the river morphology in the downstream reaches adjacent to the dam.

8.2.3.2 Conclusion

The following three cases were considered to evaluate the flood wave propagation characteristics in the considered river reach: Case 1 : Dam break hydrograph generation with PMF as inflow; Case 2 : Routing of PMF through the reach considering there is

not dam existing , Case 3; Routing of PMF through the reach considering there exists a dam, but it never fails. In brief, a summary of dam break flood characteristics (which are of major concern in the present study) is given in **Table 8.1**.

Table 8.1: Summary of Dam Break Flood Characteristics

Location (mileage)	Maximum discharge (cumec)	Time of Maximum Discharge after failure of dam (hrs)	Maximum water surface elevation (m)
Dam site (11.4 km)	85415	0.00	288.96
25.98 km d/s of dam	76958	2.50	216.11
At Madla 31.49 km	76355	3.75	210.03
42.95 km d/s of dam	75693	5.55	202.91
AT Banda 157 km	75596	28.35	82.27
Source : Computed on the basis of data from NIH Study			

The computed maximum water surface elevations in all the cases closely followed the trend of river bed profile. The water surface elevations reached in Case 1 were the highest of all the three cases, as it represented the worst case of dam break flood. The water surface elevations reached in PMF wave propagation were the lowest of all at all the cross-sections in the whole reach.

A qualitative analysis for river morphology suggested that the river reach is of hard bed-rock not amenable to degradation due to short-term high river flows. Furthermore, since the river in most part of the reach is confined by stable banks, its banks are not amenable to shifting to exhibit meandering. The input data used for the three cases under study is given **Annexure VIII.1.**

8.2.3.3 Inundation and Flood Damage (vulnerability) Mapping

A chance of the river meandering due to dam break is not there as the river is confined by stable banks. At 25.98 km downstream side of the dam the maximum water elevation is 216.11 (m) which occurs in a time of 2.50 hrs. About 77 villages need evacuation within 30 minutes after the dam break. Detailed list of Villages situated along the Right Bank Downstream of Ken Project in Proposed Inundation Area Based on Dam Break Analysis is presented in **Table 8.2.**

Table 8.2: Inundation Villages Situated Along the Right Bank of the River

Sl. No.	Right side	Distance from River (km)	Distance from Dam (km)	RL (m)
1	Tapariya	1.18	9.75	230
2	Lalar	1.02	10.08	240

Sl. No.	Right side	Distance from River (km)	Distance from Dam (km)	RL (m)
3	Kaneri	0.18	10.58	230
4	Pipartola	0.3	12.52	210
5	Baharganj	0.18	21.52	210
6	Mayla	0.16	31.49	210
7	Nahari	0.19	39.1	180
8	Bagoha	0.44	32.27	200
9	Harsa	2.1	38.39	200
10	Salaia	0.26	41.19	190
11	Jhinna	4.12	35.93	210
12	Bagalha	4.35	37.9	210
13	Bhapatpur	1.5	43.18	190
14	Bariarpur	1.05	46	190
15	Kurai	0.29	48.76	200
16	Padaraha	3.1	52.07	180
17	Balupur	3.9	47.6	160
18	Nimaha	6.28	53.21	180
19	Bilahi	3.1	53.78	170
20	Piparahi	1.54	54	160
21	Mohana	0.29	54.5	140
22	Bara	1.9	54.5	150
23	Purwa	0.6	55.5	140
24	Barkola	1.5	59	140
25	Jaitupur	5.7	55	150
26	Songurala	3.28	56	150
27	Udaipour	0.33	62	140
28	Liancha	2.53	65.3	150
29	Pharswaha	0.41	64.5	120

Detailed Information of villages situated along the Left Bank Downstream of Ken Project in proposed inundation area based on Dam Break Analysis is presented in **Table 8.3.** In all there are 48 villages which are likely to be inundated in the left flank of the river in the event of dam break.

Table 8.3: List of Inundation Villages Situated Along the Left Bank of the River

Sl. No.	Left Side	Distance from River (km)	Distance from Dam (km)	RL (m)
1	Gangau	0.09	2.18	240
2	Bhusor	1.13	5.14	230
3	Majota	1.18	6.36	230
4	Ranguwan	1.18	9.22	230
5	Dupariya	1.83	10.66	230
6	Patan	0.86	12.5	230
7	Baharpura	1.87	13.25	230

Sl. No.	Left Side	Distance from River (km)	Distance from Dam (km)	RL (m)
8	Imalaha	2.6	11.3	230
9	Jangpura	3.92	14.06	230
10	Patharguwan	3.04	12.91	230
11	Barbaspura	0.42	12.48	220
12	Majhguwan	3.59	14.5	230
13	Kollupura	3.35	13.26	230
14	Raipura	1.04	16.69	230
15	Bamori	1.33	18.74	240
16	Arjunyai	1.2	19.38	210
17	Chandranagar	4.39	19.47	220
18	Dhamma	1.98	22.7	210
19	Basota	1.6	22.7	210
20	Shivrajpur	3.51	21.76	220
21	Surajpur	2.36	26.63	200
22	Barakhera	6.35	26.63	200
23	Jatkara	12.4	38	210
24	Beniganj	11.07	27.32	200
25	Bamhara	10.7	28.06	200
26	Khajraho	13	40	200
27	Chitrai	8.22	43	200
28	Hakimpur	9.17	43.5	200
29	Nadaura	5.57	35.52	
30	Partappur	4.71	40.68	180
31	Patharaya	9.95	41	200
32	Kurerla	4.12	43.12	180
33	Chitorapurwa	6.87	42.6	180
34	Pancghamnagar	0.43	44	150
35	Banianagar	3.36	45.64	160
36	Bilhari	1.16	48.4	140
37	Muyskapurwa	0.67	50	130
38	Bachhaun	4.83	48.86	180
39	Bajcongpurwa	1.94	48.41	140
40	Jagatpur	5.56	50.7	150
41	Tikri	3.04	54.17	160
42	Bolkepurwa	4.03	54.2	150
43	Banjari	2.86	55.2	140
44	Patingpurwa	1.01	55.2	140
45	Hathauhan	1.43	59.7	120
46	Hinanta	0.55	62.4	140
47	Chilminpurwa	0.61	58.8	120
48	Hathari	1.32	60.08	120

As the flood progresses ahead the maximum water surface elevation drops to 210.03 at Madla which is 31.39 km downstream in a time of 3.75 hrs after the dam break. There are no settlements in this reach except for forest and hills. At 42.95 km downstream the

elevation of flood height drops further to 202.91 m which takes 5.55 hrs after the dam break. The flood comes to normal elevation at Banda which is 157 km from the dam and the time taken is 28.35 hrs after the dam break. The demarcation of inundation area and flood damage in the event of dam break is presented in **Figure 8.1**

8.2.4 Disaster Management Plan

The emergency planning for dam break scenario consists of 'hardware' aspects such as provision of evacuation pathways, setting up on alarms and warning systems, establishing communication systems besides the 'software' aspects concerning human behavior, procedures to be followed, roles and responsibilities, leadership, guidance and provision of information. Both hardware and software aspects need to be integrated into the design of emergency management. Following guidelines are provided for preparing a contingency plan or disaster management plan in the event of dam failure. It may be noted that this plan would serve as a reference document consisting of salient information indicating the actions to be taken at the time of disaster and hence, it has to be made as comprehensive as possible and it needs to be tested and updated periodically. The suggested format of the disaster management plan is outlined in this chapter.

8.2.4.1 Purpose of the Plan

In order to delineate the tasks and needed response, it is essential to identify and characterize the vulnerable zones through inundation maps, the nature of damage potential and the characteristics of populations and structures on the downstream areas. Based on the characteristics of each hazard zone, the needed response could be delineated in the Disaster Management Plan. Hence the objectives of the plan could be provided for:

- Timely warning and alerts
- Assess the damage potential
- Delineate emergency organization and first response / action teams
- Define roles and responsibilities
- Delineate procedures for mitigation and control of incident
- Delineate access routes and safe locations
- Delineate emergency action
- Training the personnel
- Providing public information

8.2.5 Emergency Response Organization

The Emergency Response organization must have a Chief Emergency Coordinator (CEC), who will be overall in-charge of planning, execution and coordination of all activities of Disaster Management Plan. His alternate member is also to be notified for

coordinating the emergency response activities.

Chief Emergency Coordinator is to be assisted by an Emergency Planning Group (EPG) constituted for the purpose of decision making and planning the emergency effort under the plan. This group involves all the Heads of Departments of Irrigation, Revenue, Health, Police and Public representative. To assist this group with technical information and advice, and Advisory Team consisting of various experts on dam safety and related issues need to be constituted.

A local level, preferably a Tehsil/settlement level, Emergency Action Groups (EAGs) need to be constituted for pooling, mobilizing and responding to the inundation situations. These groups essentially should consists of a local volunteer, engineering support group, rescue/evacuation team, medical / health volunteer, a police representative.

The CEC needs to report and coordinate with District collector on the disaster situation and should seek any further assistance / help from district Emergency Authorities. Alternate persons for all the constituents of groups are necessarily be identified and included in the plan.

a) Functions of Chief Emergency Coordinator

The following functions are delineated for the Chief Emergence Coordinator. He is expected to take various emergency decisions by convening the immediate meeting of Emergency Planning Group. Together, they are responsible for the following:

- Formulation and implementation of the plan
- Guidance/decision on matters of basic policy
- Activation of the emergency control centre and convening the emergency meeting
- Declaring the emergency zones with the help of technical personnel and experts
- Control on emergency operational preparedness of emergency machinery
- Holding periodic mock/ training exercises to ensure optimum preparedness at operational levels
- Development and updating hazard scenarios and cascading effects from time to time
- Mobilizing organizations, financial and human resources for the plan
- Liaison with external/ Govt. agencies and assessment of whether any public assistance is required
- Furnishing information on the incident to District, State and National level authorities and if needed competent bodies may be called for assistance
- Liaison with press/media, to report the emergency
- Declaring rehabilitation centers in case of evacuation, if called for
- Monitoring post emergency situation in terms of health care, first aid,

rehabilitation etc
- Declare all clear, once everything is normal

b) Functions of Emergency Action Group (EAG)

Emergency Action Group carries out frontline activities at the time of disaster. Preferably as many local teams as possible are formulated for the purpose. The main activities of EAG are:

- Rush to the emergency zone;
- Make systematic assessment of hazard;
- Liaise with Chief Emergency Coordinator;
- Carryout evacuation, if necessary;
- Carryout emergency actions Extend relief, first aid, human assistance; and
- Organize rehabilitation centers

8.2.5.1 Emergency Response System

The overall emergency response system needs to integrate various functional sub-systems essentially designed to generate speedy response action in terms of warnings, communications, fire fighting, medical and first aid. It is essential to delineate these systems and plan their locations and operating procedures, besides training the personnel well in advance before any emergency. Following response systems are needed for the purpose of disaster management plan.

a) Emergency Control Centre (ECC)

Emergency Control Centre will be the focal point in case of an emergency from where the operations to handle the emergency the directed and coordinated. The centre will have to be equipped with adequate resources to receive and transmit information and directions from the Chief Emergency Coordinator. Besides equipping the centre, prior arrangements should be made so as to ensure that the centre would start activating other systems immediately, once the hazard is declared.

An emergency control centre should therefore contain a well-designed communication system consisting of:

- At least two external telephones (one incoming and the other one out going fitted with simultaneous/selective broadcasting systems) with a PABX.
- Wireless/Radio equipment (VHF / walkie talkie/ pager/mobile)
- Inundation/ vulnerability maps indicating risk zones, assembly points, alternate evacuation routes, safe areas, rehabilitation centres, etc
- Telephone directory of emergency response system
- List of all emergency equipment and personnel for evacuation, personnel

protection, medical aid, etc., under the plan as well as with Govt. agencies in the district

- List of ambulances, base medical facilities, hospitals, rehabilitation centres, etc
- Reference books/chemical dossiers
- Copies of Disaster management Plan

b) Communication System

An efficient and reliable communication system is required for the success of disaster management plan. The proposed communication systems must essentially integrate the following into an Emergency Communication System:

- An Alert System
- A warning or control system
- An Emergency communication system

Emergency Alert System: An emergency alert is to be provided to the public immediately after sensing the hazard, based on the first response (FR) received from any source. Chief Emergency Coordinator should activate emergency Control Centre, and the Emergency alert may be disseminated. Initially, attempts should be made to control or localize the event in the first instance by looking into all technical aspects of the hazard and if necessary activate the needed emergency action groups to localize the event as a first response measure. If it is not possible to control the emergency, on –site emergency be declared and response action be initiated n accordance with the plan.

Emergency Warning and Control System: Based on the report of Emergency Alert, the emergency is to be notified. If the Chief Emergency Coordinator determines that the dam break is inevitable and affects health emergency plan.

The medical response plan has to cater for immediate pooling of all available medical resources and provide emergency medical treatment to the victims of the incident. A coordinated utilization of all available local medical resources in the incident areas as well as the additional resources should be mobilized under the overall charge of the one-site plan.

c) Training the Personnel

A Disaster Management Plan, no matter how carefully prepared, cannot be effective unless accompanied by training program that include periodic exercises and drills. The objectives of training in emergency preparedness are related to the following:

- Familiarize personnel with the content of the plan and its manner of implementation
- Train specific response personnel and new personnel in particular duties

requiring special skills.

- Introduce personnel to new equipment, techniques, and concepts of operation
- Keep personnel to new equipment, techniques, and concepts of operation
- Test the preparedness of response personnel
- Test the validity, effectiveness, timing, and content of the plan and implementing procedures
- Test emergency equipment
- Update and modify the plan on the basis of the experience acquired through exercises and drills
- Maintain cooperative capability within first response team and with other response/mutual aid and agencies
- Maintain good emergency response capability

d) Training Schemes for first Response Team

Every member of first response team needs initial training followed by periodic refresher courses. Members of emergency response organization would also benefit from this training, improve communication procedures, and provide an opportunity for adversely the public in downstream areas; he triggers the Emergency control centre and activates emergency response under on-site plan. He notifies accordingly with District Collector.

Thus in the process of notification, the concerned regulatory authorities are alerted and public are to be alerted by appropriate warning systems such as sirens, alarms and broadcasts.

Each type of emergency has to be given a code for easy identification of the type of emergency as also for notifying and seeking the support from various agencies. Suggested warning systems of sirens are as follows:

Disaster Warning: High pitched continuous wailing siren

All Clear: Long continuous note

These alarms/ sirens should be deployed such that the all hazard zones are covered. Radio, Walkie-talkie and paging system are very supportive and useful for communications during emergency, for which predetermined codes need to be developed.

e) Emergency Communication System

Besides developing alert and warning systems, emergency communication systems need to be established for effective communications within the identified hazard zones.

An up-to-date telephone directory of key personnel concerned with the emergency should be prepared and made available to all concerned. In order to coordinate efficiently various communications, a communication coordinator 9skilled telephone operator or PA) may be appointed at the time of emergency for maintaining a log book for the message received in/out and actions taken. Standby power arrangements and maintenance of communication equipment should be given utmost importance. As a backup to data processing and record keeping of communications, a personal computer may be employed.

f) Health and Medical Response System

Health personnel including doctors, surgeons; hospitals and ambulances have a viral part to play in the event of a major hazard. They form an integral part of medical and responders to become familiar with areas of hazards where they could be called to assist.

8.2.5.2 Mock Drills and Demonstration Exercises

Drills and exercise are vital to emergency preparedness. They involve enactment, under conditions of a mock scenario, of the implementation of the response actions performed during an emergency. Development and conduct of following two types of exercises are recommended for implementation according to the needs:

- Tabletop drills or exercises are useful for orientation purpose, while gathered around a table; the emergency response organization is presented with a situation to be resolved.

- Exercises are more comprehensive and test the entire response organization up to and including communication with all response functionaries.

All the above type of exercises is strongly recommended to be conducted at least once in a year, wherein member of first response team could actively involve. Deficiencies that may be discovered during an exercise of the plan and procedures should be corrected immediately.

8.2.5.3 Public Information System

During a crisis following an accident, the affected people, public and media representatives would like to know about the situation from time to time and the response of the emergency authority to the crisis. It is important to give timely information to the public in order to prevent panic and rumors. The emergency public information could be carried out in three phases.

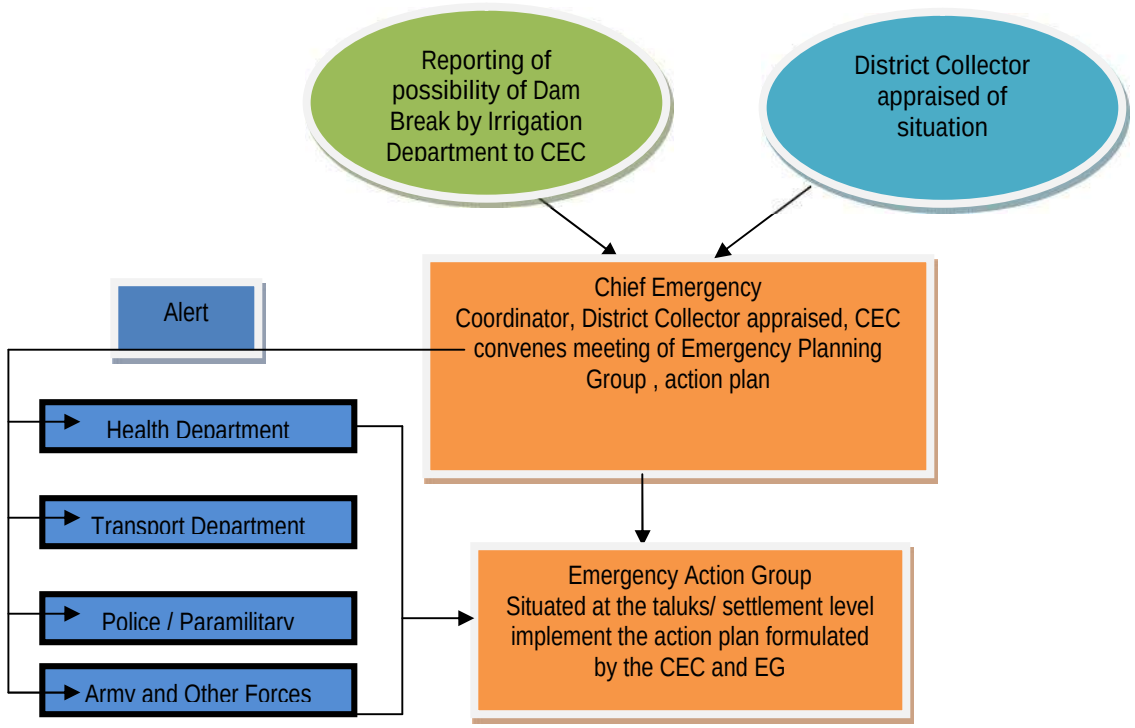
a) Before the Crisis

This will include the safety procedure to be followed during an emergency through posters, talks and mass media in local language. Leaflets containing do's/don'ts should be circulated to educate the affected population

b) During the Crisis

Dissemination of information about the nature of the incident, actions taken and instructions to the public about protective measures to be taken, evacuation, etc. are the important steps during this phase. A notification flow chart is a schematic representation of the hierarchy for notification in an emergency situation, including who is to be notified, by whom and in what priority. A suggestive notification flow chart had been prepared under the disaster management plan and the same is presented as **Chart 7.1.**

Chart 7.1: Notification Flowchart for DMP of Daudhan Dam



c) After the crisis

Attention should be focused on information concerning restoration of essential services, movement/restrictions, etc. Various tasks of the public information system would include:

- Quick dissemination of emergency instructions to the personnel and public
- To receive all calls from medical public regarding emergency situations and response meticulously
- Obtain current information from the Central Control Room
- Prepare news release
- Brief visitors/ media
- Maintain contact with hospitals and get information about the casualties

8.2.5.4 Dissemination of Public Information

Any emergency preparedness plan, however efficiently it is outlined, cannot succeed if the participation of involved community is not planned. To make the local community an active participant, community awareness along with Emergency Preparedness has to be implemented, so that it can foster understanding in the people and help in controlling emergency situations.

The target audience of warning system is public and personnel who are not trained about hazards, warning signals and protective actions. People tend to seek confirmation of the hazard from neighborhood and the media, which takes time. For a public warning system, to be effective, it must serve only as a trigger to initiate preplanned protective action by the public. Through community awareness efforts conducted by local planning committees, the public must be made aware of protective options which include sheltering within their work places and evacuation.

The community should be made aware of the following evacuation.

- The likely hazards that can occur in their vicinity
- The type of warning system employed to alert them, in case of a disaster
- The protective action that should be adapted in different situations of emergency
- Knowledge of the escape routes and assembly points, in case of evacuation from disaster zones.

8.2.6 Other Risks and Management Plan

The power generation units under the project may have the following types risk factors;

- Turbine Generator Explosion;
- Fires in Cable Galleries;
- Transformer Hazards;
- Sub-station Hazards;
- Fuel oil handling system Hazards;
- Storage / Warehouses – hazards

The details of the hazards are explained in the following paragraphs.

Turbine Generator Explosion: H2 gas explosion is a possible hazard in Generator. However, the Generator is designed to withstand explosion. Seal oil system is also provided for the Generator to prevent the leakage of H2 gas. And also the H2 purity is continuously monitored and maintained always above 98%. All the H2 cylinders are checked for high purity.

Fires in Cable Galleries: The main hazard in cable galleries is fires. To control fires, heat sensors and smoke detectors are provided in the cable galleries to detect the fires at the inception stage itself. Also fire resistance barriers are provided at the cable intersections, intermittent places on cable trays, cable raisers and cable entry points.

Transformer Hazards: To take care of all the possible hazards an adequate protection system are available as per Engineering and in case of failure emulsifier system is provided to quench fires.

Sub-station Hazards: To take care of the problems relating to short circuits, supporting insulators, etc the following precautions are to be taken:

- Plugging of cable gland plates and breaker inspection plates against reptile entry and earthing to the cable gland.
- Periodical inspection / testing of switchgear equipment.
- Providing proper nomenclature of switchgear equipment with regards to voltage level, feeder description and panel numbering to avoid wrong identification.

Fuel oil handling system hazards: The main hazard in fuel oil section is fires and storage tank explosion. However, to contain the chances of fires / explosions due to spillover, dyke walls are provided all around the fuel oil storage tanks. Apart from this, foam flooding system and MV water spray systems are provided on all Fuel Oil tanks. The level gauges and temperature monitors are also provided on the fuel oil tanks.

Storage / Warehouses – hazards: The main hazard in stores/warehouses is fire and explosion due to stored gas cylinders. However to prevent the chances of fires and explosions, gas cylinders and flammable materials are to be stored safely with utmost care and precautions. Fire hydrant / portable fire extinguishers systems are to be made available all around the materials storage.

8.2.7 Fire Fighting

The above analysis indicates that fire is one of the major disasters in project area. The following measures will be included to constrain the fire accident. The plant shall be

protected against fire hazards and shall be equipped with minimum fire protection systems. Main source of water supply for firefighting is raw water which is drawn through pumps from reservoir. The nearest fire station is situated at Khajuraho about 40 km from the project site. The fire station shall be made well equipped to meet any contingency. Minimum requirement of firefighting equipment such as CO2, foam and DCP may be maintained at the project location.

Fixed Fire Detection and Protection systems: The systems for protection and detection shall be kept at the project site as given **Table 8.4.**

Table 8.4: Fixed Fire Detection and Protection System in Project Area

Sl. No	Type & Nomenclature	Approximate capacity	Premises
1	Water sprinkler system and Emulsifier	5 kgs pressure	On all transformers
2	Foam pourer	5 kgs pressure	On all fuel oil tanks
3	Medium velocity water spray system	5 kgs pressure	At LDO tanks
4	Smoke detectors	5 kgs pressure	At all control rooms switch gear rooms, cable galleries, etc.

Portable Fire Extinguishers: In addition to above fire fighting equipments, portable and mobile fire extinguishers have to be installed at all locations of the plant including Main Plants, Control rooms, Switch Gear rooms, Laboratories, Off sites, Administration building etc. Details are tabulated below:

Details of Portable Fire Extinguishers		
Sl. No.	**Type of Extinguishers**	**Capacity**
1	CO_2 Type	6.8 kg
		22.5 kg
2	Foam type	9.0 Lts
		50 Lts
3	DCP type	5 kg
		75 kg
4	ABC Power Type	5 kg

Hospital Facility: Dispensary is proposed at the camp colony situated at Gangau village with fully equipped separate disaster ward and burns ward shall be made available. First Aid centre also be made available inside the project premises and manned round the clock. Ambulance facility may also be provided at the project dispensary.

8.2.8 Cost Estimates

The budget for different activities required to be carried out for mitigation and prevention of dam break hazard and other hazards are given in **Table 8.4**. Cost estimates for the implementation of disaster management plan, is assed to be **Rs. 140.00 lakh**.

Table 8.4: Budget for Different Activities for Disaster Management in Project Area

Sl. No	Particulars	Amount in Rs Lakhs.
1	Installation of alert systems, setting up control room etc	50.00
2	Setting up of communication system	15.00
3	Setting up of Emergency Response organization	15.00
4	Public Information System	15.00
5	Installation of Fire Fighting Equipment	35.00
6	Training & Miscellaneous	10.00
	Total	**140.00**
Source : Estimated by AFC team		

Annexure – VIII.1

								Input data for case 1
KEN- BETWA LINK KEN RIVER (option 4)								
INDIAN INSTITUTE OF TECHNOLOGY								
ROORKEE-247667 (U.K)								
2	1	0	3	50	0	0	1	
9	289	0.03	220.83	30.74	1	220.83	0	
289	289	275	0	0	0	130	2690	
0	36401	51438	5280	53724	56043	58394	60778	
0	8.5	12	12.3	12.5	13	13.5	14	
2	50							
58950.6	58874.7	58174.7	56856.1	54824.3	52020.2	48677.7	45113.6	
41479	37887.8	34225.4	30462	26744.9	23285.5	20172.2	17411.4	
3699.7	3141.5	2690	2690	2690	2690	2690	2690	
2690	2690	2690	2690	2690	2690	2690	2690	
2690	2690	2690	2690	2690	2690	2690	2690	
2690	2690							
46	5	5	1	0	0	0	0	
1	2	3	4	5				
2.4								
243	250.56	270.56	280	294.17				
359.93	787.99	1741.25	2033.07	2354.09				
0	0	0	0	0				
242.67	260	270	280	294				
758.75	1478.6	1799.61	2082	2373.54				
0	0	0	0	0				
2.8								
242	250	260.46	280	293.94				
369.65	719.84	1322.96	1935.61	2334.63				
0	0	0	0	0				
3								
24069	250	260	286.71	293.18				
669.31	1105.06	1774.32	2614.79	3486.38				
0	0	0	686	915				
3.2								
240	250	270.5	280	294				
793.77	1618.67	2428.02	3439.69	3704				
0	0	341	483	520				
3.4								
238.43	256.25	3237.35	3393	3610.9				
0	280	702	735	783				
3.6								
238.05	249.77	260	280	293.46				
531.13	953.31	1847.77	2519.45	3350.2				

0	326	632	862	1146				
3.8								
236.54	250.74	270.16	280.56	294				
463.03	1389.21	2216.3	2437.74	3268.48				
0	0	0	0	0				
4								
236.16	250	270	280	294.12				
476.65	1484.43	2505.84	83.07	3500.2				
0	0	0	0	0				
4.2								
236.08	242.64	270	285	294				
622.57	1042.8	2800	4361.87	6000				
0	0	0	0	0				
4.4								
236.06	247.5	270	280.23	289.39				
381.32	994.17	2176.98	3036.97	3459.1				
0	0	0	0	0				
4.6								
236.04	250.42	262.73	280.23	287.51				
482.48	1431.91	2459.14	3003.89	3533				
0	0	233	285	335				
4.8								
235.44	240.28	250.56	284.44	287.91				
373.54	1182.88	1914.4	3515.18	5000				
0	0	2469	497	707				
5								
235.09	240.56	250	282.5	287.43				
389.1	1261	1852.14	3939.69	5000				
0	0	0	186	631				
5.2								
234.53	240	260.28	280	287.87				
529.18	1509.73	2256.81	4013.23	4400				
0	0	0	208	228				
5.4								
234.33	240	250	268.06	286.27				
295.72	1431.91	1836.58	2396.89	3564.2				
0	0	0	373	555				
5.6								
234.3	240.68	260	280.26	287.19				
640.53	1440.29	2580	3282.87	4000				
0	0	0	0	0				
5.8								
233.89	240.05	356.57	270.9	292.28				
451.36	1618.66	2412.45	2817.08	3735.41				
0	0	0	263	349				

6								
233.8	250.42	260	274.72	291.47				
544.75	1743.2	2334.59	2879.38	3704.28				
0	0	295	364	468				
6.2								
233.4	250.56	266.39	280	289.15				
638.13	1307.39	2785.99	3719.85	3891.05				
0	234	716	954	1000				
6.4								
233.1	250.42	270	280	294				
418.1	916.85	1392	1449.42	1743				
0	0	0	270	405				
6.6								
233.09	250.42	258.52	270	285.69				
340.46	856.03	1303.5	1719.61	2147.81				
0	0	317	437	522				
6.8								
233.08	251.06	260.79	280	285.68				
422.18	1282.92	1824.91	2492	3270				
0	0	550	608	798				
7								
233.07	246.53	260.46	275	290.7				
428.8	1120.62	2116.74	3066.15	3488.46				
0	0	451	653	743				
7.2								
233.06	246.53	260.14	270.51	280.12				
451.73	1167.32	3206.23	3284.05	3455				
0	559	1535	1573	1655				
7.4								
233.05	240.28	246.39	260	283.08				
357.98	684.83	1898.83	3221.79	3564.2				
0	343	198	335	371				
7.6								
233.04	240.83	256.11	280	307.89				
245.13	536.96	1050.58	2696.5	2941.13				
0	0	175	400	475				
7.8								
233.03	250.42	270.19	286.79	294				
221.79	800.1	1862.24	2007.78	2556.42				
0	0	0	235	526				
8								
233.02	240	250.09	268.56	287.32				
295.72	443.58	840.46	1813.23	1891.04				
0	0	0	0	0				
8.2								

233.01	240	273.38	278.26	294.17				
359.92	729.55	1925	1935.8	1964.98				
0	0	0	100	400				
8.4								
233	250	260	280	294				
904.67	1498.05	1896.88	2263.53	2412.45				
0	0	0	0	0				
8.6								
232.59	250	270	280	288.84				
1001.94	1702.33	1994.16	2042.8	2101.17				
0	0	0	0	0				
8.8								
232.08	245.19	260	280	293.28				
1147.86	1634.24	1896.88	2295.72	2433				
0	0	117	142	150				
9								
231.57	250	265	280	287.95				
1332.69	1955.25	2188.79	2334.63	2402.72				
0	0	0	0	0				
9.2								
231.06	245	260	285	293.35				
1202.34	1587.55	1715.95	2042.8	2031.13				
200	500	700	1200	1500				
9.4								
230.55	240	260	280	294				
967.76	1361.87	2548.63	3229.57	3579.76				
0	206	428	542	601				
9.6								
229.04	240.74	260	280	294				
1225.68	1595.33	2412.45	3910.51	4143.97				
0	214	106	820	869				
9.8								
228.03	240.35	270.74	280	294				
1614.79	1770.43	2976.65	3229.57	4007.78				
0	0	214	408	506				
10								
227.02	250.37	270.74	280.37	294				
1675.1	2029.18	2165.37	2233.47	2642.02				
0	0	0	200	250				
10.2								
226.01	250.37	270.74	290.74	294				
1712.06	1926.07	2120.62	2412.45	3832.69				
0	0	0	406	500				
10.4								
225.81	240.37	260.37	271.11	295.19				

1167.31	2042.81	2351.08	4085.6	4202.33				
0	0	922	1800	1900				
10.6								
225.42	235.83	241.79	280.42	294				
1171.69	2256.81	3326.85	2463.04	3540.86				
0	0	0	0	0				
10.8								
224.07	240.28	259.67	276.85	294.91				
1167.31	2256.81	3657.59	3871.6	4105.06				
0	0	350	400	425				
11								
223.07	230.42	250.19	270.28	273.35				
817.12	2178.99	2626.46	3307.39	3618.68				
0	0	0	0	0				
11.2								
222.06	244.44	260.65	281.02	210.64				
836.57	2937.74	3132.29	3715.95	3929.96				
0	0	0	0	0				
11.4								
220.83	240.74	260.64	280.56	291				
830.74	1975.34	2124.51	2301.55	2500				
0	0	0	0	0				
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	

0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
0.028	0.028	0.1	0.066	0.2	0.066	0.066	0.2	
0.066	0.1	0.1	0.033	0.2	0.066	0.066	0.066	
0.2	0.049	0.2	0.1	0.1	0.099	0.2	0.2	
0.04	0.2	0.05	0.033	0.022	0.022	0.1	0.2	
0.099	0.1	0.099	0.2	0.1	0.066	0.1	0.099	
0.1	0.066	0.049	0.033	0.1				
0	0	-0.75	0	0	0	0	0	
0	0.3	-1	0	0	0	0	0	
0	0	0	0.3	-0.6	-0.6	0	0	
0	0	0	0.3	0	0	0.3	0	
0.1	0.1	-0.7	0	0.1	0	-1	-0.7	
0.2	0	0.3	0.3	0.25				
0	0	0	289	1.983	0	0	0	
0.17	0.03							
15	5	5	1	0	0	0	0	
1	2	3	4	5				
3.75								
	220.19	225.21	230.39	235.25	240.12			
	311.29	1566.15	1974.71	2033.07	2198.44			
	826.85	826.85	826.85	826.85	826.85			
8.5								
	215.09	220.07	225.05	229.11	232.38			
	252.92	466.92	772.02	3938.48	4034.99			

	136.18	330.74	1272.62	1272.62	1272.62			
11.5								
	208.14	230.13	234.95	239.97	243.95			
	289.5	579.01	791.31	1891.44	6417.1			
	0	0	0	1329.99	1395.66			
31.5								
	197.54	200.05	202.77	204.66	205.92			
	1272.62	1338.96	1471.65	1526.94	3395.66			
	0	0	0	458.39	520.62			
45.25								
	189.92	190.86	195.05	197.02	200.16			
	180.94	825.09	1483.71	2004.82	4255.73			
	0	0	0	115.8	600.72			
47.5								
	180.97	183.48	185.99	189.14	192.91			
	525.93	714.11	798.3	1635.7	2243.66			
	0	0	0	0	0			
57.75								
	135.31	140.26	145.39	147.41	149.79			
	475.27	1144.38	1283.48	1546.44	1799.76			
	178.53	178.53	178.53	178.53	178.53			
68								
	135.26	140.03	145.16	150.1	155.24			
	1158.02	1326.9	2261.77	2521.11	3371.54			
	0	0	0	168.88	168.88			
77								
	132.77	137.59	142.83	147.64	152.67			
	717.73	952.96	2394.45	2509.09	2846.81			
	0	778.05	778.05	965.81	1032.69			
91								
	124.9	130.03	135.16	139.74	145.05			
	687.57	778.05	3642.94	3474.07	3968.64			
	0	0	619.01	619.01	883.48			
111								
	115.05	120.5	125.1	130.74	145.05			
		693.61	868.51	3474.94	3968.64			
	0	0	84.44	319.67	1073.57			
122.5								
	110.18	115.05	120.39	124.95	130.13			
	448.73	516.28	1215.92	1925.21	3773.22			
	0	0	357.06	1109.77	1109.77			
134.75								
	100.26	105.03	109.79	115.29	120.24			
	627.26	717.73	1013.27	3347.4	3757.54			
	0	0	120.63	120.63	156.82			

148.5								
	85.05	90.29	95.73	99.71	105.16			
	817.86	984.32	1650.18	1765.98	2185.77			
	0	0	108.56	376.36	1021.51			
157								
	70.45	75.39	80.34	85.29	89.87			
	984.32	1150.79	1469.24	3517.49	3720.15			
	0	0	1548.85	1548.85	1548.85			
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	0.947	0.332	0.668	0.764	0.449	1	1	1
	0.973	0.909	0.885	0.871	0.908	0.911		
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0.11	0.51	0	0

							Input data for Case 2
KEN- BETWA LINK KEN RIVER (option 4)							
INDIAN INSTITUTE OF TECHNOLOGY							
ROORKEE-247667 (U.K)							
9	0	0	3	50	0	0	1
2	50						
2786.4	3864.8	5307	7059.4	9173	11739.2	14798.6	18376.1
22408.2	26709.9	31171.5	35673.4	40067.8	44289.6	48245.3	51763.5
54726.4	56976	58360.2	58950.6	58874.7	58174.7	56856.1	54824.3
52020.2	677.7	45113.6	41479	37887.8	34225.4	30462	26744.9
23285.5	20172.2	17411.4	14937.5	12674.7	10645.3	8902.7	7447.3
6236.8	5227.5	4387.2	3699.7	3141.7	2690	2690	
2690	2690						
53	5	5	4	0	0	0	0
51	52	53	49	50			
2.4							

243	250.56	270.56	280	294.17			
359.93	787.99	1741.25	2033.07	2354.09			
0	0	0	0	0			
2.6							
242.67	260	270	280	294			
758.75	1478.6	1799.61	2082	2373.54			
0	0	0	0	0			
2.8							
242	250	260.46	280	293.94			
369.65	719.84	1322.96	1935.67	2334.63			
0	0	0	0	0			
3							
240.69	250	260	286.71	293.18			
669.31	1105.06	1774.32	2614.79	3486.38			
0	0	0	686	915			
3.2							
240	250	270.5	280	294			
793.77	1618.67	2428.02	3439.69	3704			
0	0	341	483	520			
3.4							
238.43	256.25	270	280	293.91			
638.13	1291.83	3237.35	3393	3610.9			
0	280	702	735	783			
3.6							
238.05	249.77	260	280	293.46			
531.13	953.31	1847.77	2519.45	3350.2			
0	326	632	862	1146			
3.8							
236.54	250.74	270.16	280.56	294			
463.03	1389.21	2216.3	2437.74	3268.48			
0	0	0	0	0			
4							
236.16	250	270	280	294.12			
476.65	1484.48	2505.85	83.07	3500.2			
0	0	0	0	0			
4.2							
236.08	242.64	270	285	294			
622.57	1042.8	2800	4361.87	6000			
0	0	0	0	0			
4.4							
236.06	247.5	270	280.23	289.39			
381.32	994.17	2176.98	3036.97	3459.1			
0	0	0	0	0			
4.6							
236.04	250.42	262.73	280.23	287.51			

482.48	1431.99	2459.14	3003.89	3533			
0	0	233	285	334			
4.8							
235.44	240.28	250.56	284.44	287.91	3		
373.54	1182.88	1914.4	3515.18	5000			
0	0	249	497	707			
5							
235.09	240.56	250	282.5	287.43			
389.1	1261	1852.14	3939.69	5000			
0	0	0	186	631			
5.2							
234.53	240	260.28	280	287.87			
529.18	1509.73	2256.81	4013.23	4400			
0	0	0	208	228			
5.4							
234.33	240	250	268.06	286.27			
295.72	1431.91	1836.58	2396.89	3564.2			
0	0	0	373	555			
5.6							
234.3	240.68	260	280.26	287.19			
640.53	1440.29	2580	3282.87	4000			
0	0	0	0	0			
5.8							
233.89	240.05	256.57	270.19	292.28			
451.36	1618.66	2412.45	2817.08	3735.41			
0	0	0	263	349			
6							
233.8	250.42	260	274.72	291.47			
544.75	1743.2	2334.59	2879.38	3704.28			
0	0	295	364	468			
6.2							
233.7	250.56	266.39	280	289.15			
638.13	1307.39	2785.99	3719.85	3899.05			
0	234	716	955	1000			
6.4							
233.1	250.42	270	280	294			
418.1	916.85	1392	1449.42	1743			
0	0	0	270	405			
6.6							
233.09	250.42	258.52	270	285.69			
340.46	856.03	1303.5	1799.61	2147.81			
0	0	317	437	522			
6.8							
233.08	251.06	260.79	280	285.68			
422.18	1282.92	1824.91	2492	3270			

0	0	550	608	798			
7							
233.07	246.53	260.46	275	290.7			
428.8	1120.62	2116.74	3066.15	3488.46			
0	0	451	653	743			
7.2							
233.06	246.53	260.14	270.51	280.12			
451.73	1167.32	3206.23	3284.05	3455			
0	559	1535	1573	1655			
7.4							
233.05	240.28	246.39	260	283.08			
357.98	684.83	1898.83	3221.79	3564.2			
0	343	198	235	371			
7.6							
233.04	240.83	256.11	280	307.89			
245.13	536.96	1050.58	2696.5	2941.13			
0	0	175	400	475			
7.8							
233.03	250.42	270.19	286.71	294			
221.79	800.1	1862.64	2007.78	2556.42			
0	0	0	235	526			
8							
233.02	240	250.09	268.56	287.32			
295.72	443.58	840.46	1813.23	1891.04			
0	0	0	0	0			
8.2							
233.01	240	273.38	278.26	294.17			
359.92	729.57	1925	1935.8	1964.98			
0	0	0	100	400			
8.4							
233	250	260	280	294			
904.67	1498.05	1896.88	2263.53	2412.45			
0	0	0	0	0			
8.6							
232.59	250	270	280	288.84			
1001.94	1702.33	1994.16	2042.8	2101.17			
0	0	0	0	0			
8.8							
232.08	245.19	260	280	293.28			
1147.86	1634.24	1896.88	2295.72	2433			
0	0	117	142	150			
9							
231.57	250	265	280	287.95			
1332.69	1955.25	2188.71	2334.63	2402.72			
0	0	0	0	0			

9.2							
231.06	245	260	285	293.35			
1202.34	1587.55	1715.95	2042.8	2031.13			
200	500	700	1200	1500			
9.4							
230.55	240	260	280	294			
967.76	1367.87	2548.63	3229.57	3579.76			
0	206	428	542	601			
9.6							
229.04	240.74	260	280	294			
1225.68	1595.33	2412.45	3910.51	4143.97			
0	214	506	820	869			
9.8							
228.03	240.34	270.74	280	294			
1614.79	1770.43	2976.65	3229.57	4007.78			
0	0	214	408	506			
10							
227.02	250.37	270.74	280.37	294			
1675.1	2029.18	2165.37	2233.47	2642.02			
0	0	0	200	250			
10.2							
226.01	250.37	270.77	290.74	294			
1712.06	1126.07	2120.62	2412.44	3832.69			
0	0	0	406	500			
10.4							
225.81	240.37	260.37	271.11	295.19			
1161.31	2042.81	2354.08	4085.6	4202.33			
0	0	922	1800	1900			
10.6							
225.42	235.83	241.79	280.42	294			
1171.69	2256.81	3326.85	3463.04	3540.86			
0	0	0	0	0			
10.8							
224.07	240.28	259.68	276.85	294.91			
1167.31	2256.81	3657.59	3871.6	4105.06			
0	0	350	400	425			
11							
223.07	230.42	250.19	270.28	293.35			
817.12	2178.99	2626.46	3307.39	3618.68			
0	0	0	0	0			
11.2							
222.06	244.44	260.65	281.02	290.64			
836.57	2937.74	3132.29	3715.15	3929.96			
0	0	0	0	0			
11.4							

220.83	240.74	260.65	280.56	291			
830.74	1975.34	2124.51	2301.55	2500			
0	0	0	0	0			
15.15							
220.19	225.21	230.39	235.25	240.12			
311.29	1566.15	1974.71	2033.07	2198.44			
826.85	826.85	826.85	826.85	826.85			
19.9							
215.09	220.07	225.05	229.11	232.38			
252.92	466.92	772.02	3938.48	4034.99			
136.18	330.74	1272.62	1272.62	1272.62			
22.9							
208.14	230.13	234.95	239.97	243.95			
289.5	579.01	791.31	1891.45	6417.1			
0	0	0	1329.99	1395.66			
42.9							
197.54	200.05	202.77	204.66	245.92			
1272.62	1338.96	1471.65	1526.94	3395.66			
0	0	0	458.39	520.62			
56.65							
189.92	190.86	195.05	197.02	200.16			
180.94	825.09	1483.71	2004.82	4255.73			
0	0	0	115.8	600.72			
58.9							
180.97	183.48	185.99	189.14	192.91			
525.93	714.11	798.3	1635.71	2243.66			
0	0	0	0	0			
59.15							
135.31	140.26	145.59	147.41	159.79			
475.27	1144.38	1283.48	1546.44	1799.76			
178.53	178.53	178.53	178.53	178.53			
	0.02						
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.028	0.028	0.1	0.066	0.2	0.066	0.066	0.2
0.066	0.1	0.1	0.033	0.2	0.066	0.066	0.066
0.2	0.049	0.2	0.1	0.1	0.09	0.2	0.2
0.04	0.2	0.05	0.033	0.022	0.022	0.1	0.2
0.09	0.1	0.1	0.2	0.1	0.066	0.2	0.09
0.1	0.066	0.049	0.033	0.1	1	1	1

1	3	1	1				
0	0	-0.75	0	0	0	0	0
0	0.3	-1	0	0	0	0	0
0	0	0	0.3	-0.6	-0.6	0	0
0	0	0	0.3	0	0	0.3	0
0.1	0.1	-0.7	0	0.1	0	-1	-0.7
0.2	0	0.3	0.3	0.25	0	0	0
0	0	0	0				
0	0	0	0	1.983	0.51	0	0

							Input data for Case 3
KEN- BETWA LINK KEN RIVER (option 4)							
INDIAN INSTITUTE OF TECHNOLOGY							
ROORKEE-247667 (U.K)							
2	1	0	3	50	0	0	1
9	300	0.03	220.83	30.74	3	220.8	0
300	275	275	0	0	0	130	5000
0	36401	51438	52806	53724	56043	58394	60778
0	8.5	12	12.3	12.5	13	13.5	14
2	50						
1332.3	1598.3	2056.1	2786.4	3864.8	5307	7059.4	9173
11739.2	14798.6	18376.1	22408.2	26709.9	31171.5	35673.4	40067.8
44289.6	48245.3	51763.4	54726.4	56976	58360.2	58950.6	58874.7
58174.7	56856.1	54824.3	52020.2	48677.7	45113.6	41479	37887.8
34225.4	30462	26744.9	23285.5	20172.2	17411.4	14937.5	12674.7
10645.3	8902.7	7447.3	6236.8	5227.5	4387.2	3699.7	3141.5
2690	2690						
46	5	5	1	0	0	0	0
16	17	18	19	20			
2.4							
243	250.56	270.56	280	294.17			
359.93	787.99	1741.25	2033.07	2354.09			
0	0	0	0	0			
2.6							
242.67	260	270	280	294			
758.75	1478.6	1799.61	2082	2373.54			
0	0	0	0	0			
2.8							
242	250	260.46	280	293.94			
369.65	719.84	1322.96	1935.61	2334.63			
0	0	0	0	0			
3							
240.69	250	262	286.71	293.18			
669.31	1105.06	1774.32	2614.79	3486.38			
0	0	0	686	915			
3.2							
240	250	270.5	280	294			
793.77	1618.67	2428.02	3439.69	3704			
0	0	341	483	520			
3.4							
238.43	256.25	270	280	293.91			
638.13	1291.83	3237.35	3393	3610.9			
0	280	702	705	783			
3.6							
238.05	249.77	260	280	293.46			

531.13	953.31	1847.77	2519.45	3350.2			
0	326	632	862	1146			
3.8							
236.54	250.74	270.16	280.56	294			
463.03	1389.21	2216.3	2437.74	3268.48			
0	0	0	0	0			
4							
236.16	250	270	280	294.12			
476.65	1484.43	2505.84	83.07	3500.2			
0	0	0	0	0			
4.2							
236.08	242.64	270	285	294			
622.57	1042.8	2800	4361.87	6000			
0	0	0	0	0			
4.4							
236.06	247.5	270	280.23	289.39			
381.32	994.17	2176.98	3036.97	3459.1			
0	0	0	0	0			
4.6							
236.04	250.42	262.73	280.23	287.51			
482.48	1431.91	2459.14	3003.89	3533			
0	0	233	285	335			
4.8							
235.44	240.28	250.56	284.44	287.91			
373.54	1182.88	1914.4	3551.18	5000			
0	0	249	497	707			
5							
235.09	240.56	250	282.5	287.43			
389.1	1261	1852.14	3939.69	5000			
0	0	0	186	631			
5.2							
234.53	240	260.28	280	287.87			
529.18	1509.73	2256.81	4013.23	4400			
0	0	0	208	228			
5.4							
234.33	240	250	268.06	286.27			
295.72	1431.91	1836.58	2396.89	3564.2			
0	0	0	373	555			
5.6							
234.3	240.68	260	280.26	287.19			
640.53	1440.29	2580	3282.87	4000			
0	0	0	0	0			
5.8							
233.89	240.05	256.57	270.19	292.28			
451.36	1618.66	2412.45	2817.08	3735.41			

0	0	0	263	349			
6							
233.8	250.42	260	274.72	291.47			
544.75	1743.2	2334.59	2879.38	3704.28			
0	0	295	364	468			
6.2							
233.7	250.56	266.39	280	289.15			
638.13	1307.39	2785.99	3711.85	3891.05			
0	234	716	955	1000			
6.4							
233.1	250.42	270	280	294			
418.1	916.85	1392	1449.42	1743			
0	0	0	270	405			
6.6							
233,09	250.42	258.52	270	285.69			
340.46	856.03	1303.5	1799.61	2147.81			
0	0	317	437	522			
6.8							
233.08	251.06	260.79	280	285.68			
422.18	1282.92	1824.91	2492	3270			
0	0	550	608	798			
7							
233.07	246.53	260.46	275	290.7			
428.8	1120.62	2116.74	3066.15	3488.46			
0	0	451	653	743			
7.2							
233.06	246.53	260.14	270.51	280.12			
451.73	1167.32	3206.23	3284.05	3455			
0	559	1535	1573	1655			
7.4							
233.05	240.28	246.39	260	283.08			
357.98	684.83	1898.83	3221.79	3564.2			
0	343	198	335	371			
7.6							
233.04	240.83	256.11	280	307.89			
245.13	536.96	1050.58	2696.5	2941.13			
0	0	175	400	475			
7.8							
233.03	250.42	270.19	286.71	294			
221.79	800.1	1862.64	2007.78	2556.42			
0	0	0	235	526			
8							
233.02	240	250.09	268.56	287.32			
295.72	443.58	840.46	1813.23	1891.04			
0	0	0	0	0			

8.2							
233.01	240	273.38	278.26	294.17			
359.92	729.57	1925	1935.8	1964.98			
0	0	0	100	400			
8.4							
233	250	260	280	294			
904.67	1498.05	1896.88	2263.53	2412.45			
0	0	0	0	0			
8.6							
232.59	250	270	280	288.84			
1001.94	1702.33	1994.16	2042.8	2101.17			
0	0	0	0	0			
8.8							
232.08	245.19	260	280	293.28			
1147.86	1634.24	1896.88	2295.72	2433			
0	0	117	142	150			
9							
231.57	250	265	280	287.95			
1332.69	1955.25	2188.71	2334.63	2402.72			
0	0	0	0	0			
9.2							
231.06	245	260	285	293.35			
1202.34	1587.55	1715.95	2042.8	2031.13			
200	500	700	1200	1500			
9.4							
230.55	240	260	280	294			
967.76	1361.87	2548.63	3229.57	3579.76			
0	206	428	542	601			
9.6							
229.04	240.74	260	280	294			
1225.68	1595.33	2412.45	3910.51	4143.97			
0	214	20-May	820	869			506
9.8							
228.03	240.34	270.74	280	294			
1614.79	1770.43	2976.65	3229.57	4007.78			
0	0	214	408	506			
10							
227.02	250.37	270.74	280.37	294			
1675.1	2029.18	2165.37	2233.47	2642.02			
0	0	0	200	250			
10.2							
226.01	250.37	270.74	290.74	294			
1712.06	1926.07	2120.62	2412.45	3832.69			
0	0	0	406	500			
10.4							

225.81	240.37	260.37	271.11	295.19			
1167.31	2042.81	2354.08	4085.6	4202.33			
0	0	922	1800	1900			
10.6							
225.42	235.83	241.79	280.42	294			
1171.69	2256.81	3326.85	3463.04	3540.86			
0	0	0	0	0			
10.8							
224.07	240.28	259.68	276.85	294.91			
1167.31	2256.81	3657.59	3871.6	4105.06			
0	0	350	400	425			
11							
223.07	230.42	250.19	270.28	273.35			
817.12	2178.99	2626.46	3307.39	3618.68			
0	0	0	0	0			
11.2							
222.06	244.44	260.65	281.02	290.64			
836.57	2937.74	3132.29	3715.95	3929.96			
0	0	0	0	0			
11.4							
220.83	240.74	260.65	280.56	291			
830.74	1975.34	2124.51	2301.55	2500			
0	0	0	0	0			
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04

0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.028	0.028	0.1	0.066	0.2	0.066	0.066	0.2
0.066	0.1	0.1	0.033	0.2	0.066	0.066	0.066
0.2	0.049	0.2	0.1	0.1	0.099	0.2	0.2
0.04	0.2	0.05	0.033	0.022	0.022	0.1	0.2
0.099	0.1	0.099	0.2	0.1	0.066	0.1	0.099
0.1	0.066	0.049	0.033	0.1			
0	0	-0.75	0	0	0	0	0
0	0.3	-1	0	0	0	0	0
0	0	0	0.3	-0.6	-0.6	0	0
0	0	0	0.3	0	0	0.3	0
0.1	0.1	-0.7	0	0.1	0	-1	-0.7
0.2	0	0.3	0.3	0.25			
0	0	0	277	1.983	0	0	0
0.01	0.04						
15	5	5	1	0	0	0	0
2	5	8	12	15			
3.75							
220.19	225.21	230.39	235.25	240.12			
311.29	1566.15	1974.71	2033.07	2198.44			
826.85	826.85	826.85	826.85	826.85			
8.5							

215.09	220.07	225.05	229.11	232.38			
252.92	466.92	772.02	3938.48	4034.99			
136.18	330.74	1272.62	1272.62	1272.62			
11.5							
228.14	230.13	234.95	239.97	243.95			
289.5	579.01	791.31	1891.44	6417.1			
0	0	0	1329.99	1395.66			
31.5							
197.54	200.05	202.77	204.66	205.92			
1272.62	1338.96	1471.65	1526.94	3395.66			
0	0	0	458.09	520.62			
45.25							
189.92	190.86	195.05	197.02	200.16			
180.94	825.09	1483.71	2004.82	4255.73			
0	0	0	115.8	600.72			
47.5							
180.97	183.48	185.99	189.14	192.91			
525.93	714.11	798.3	1635.71	2243.66			
0	0	0	0	0			
57.75							
135.31	140.26	145.39	147.41	141.79			
475.27	1144.38	1283.48	1546.44	1799.76			
178.53	178.53	178.53	178.53	178.53			
68							
135.26	140.03	145.16	150.1	155.24			
1158.02	1326.9	2261.77	2521.11	3371.54			
0	0	0	168.88	168.88			
77							
132.77	137.59	142.83	147.64	152.67			
717.73	952.96	2394.45	2509.09	2846.81			
0	778.05	778.05	956.81	1032.69			
91							
124.9	130.03	135.16	139.74	145.05			
687.57	778.05	3642.94	3474.07	3968.64			
0	0	619.01	619.01	883.48			
111							
115.05	120.5	125.1	130.13	135.16			
693.61	868.51	1592.28	1682.75	2026.54			
0	0	84.44	319.67	1073.57			
122.5							
110.18	115.05	120.39	124.95	130.13			
448.73	516.28	1215.92	1925.21	3773.22			
0	0	357.06	1109.77	1109.77			
134.75							
100.26	105.03	109.79	115.29	120.24			

627.26	717.73	1013.27	3347.41	3757.54			
0	0	120.63	120.63	156.82			
148.4							
85.05	90.29	95.73	99.71	105.16			
817.86	984.32	1650.18	1765.98	2185.77			
0	0	108.56	376.36	1021.51			
157							
70.45	75.39	80.34	85.29	89.87			
984.32	1150.79	1469.24	3517.49	3720.15			
0	0	1548.85	1548.85	1548.85			
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
0.9	0.9	0.9	0.9	0.9	0.9		
0	0	0	0	0.01	0	0	0