

STORM WATER MANAGEMENT IN HILLY AREAS WITH A FOCUS ON ENGINEERING SOLUTIONS



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SOME EXAMPLE OF POOR DRAINAGE SYSTEM



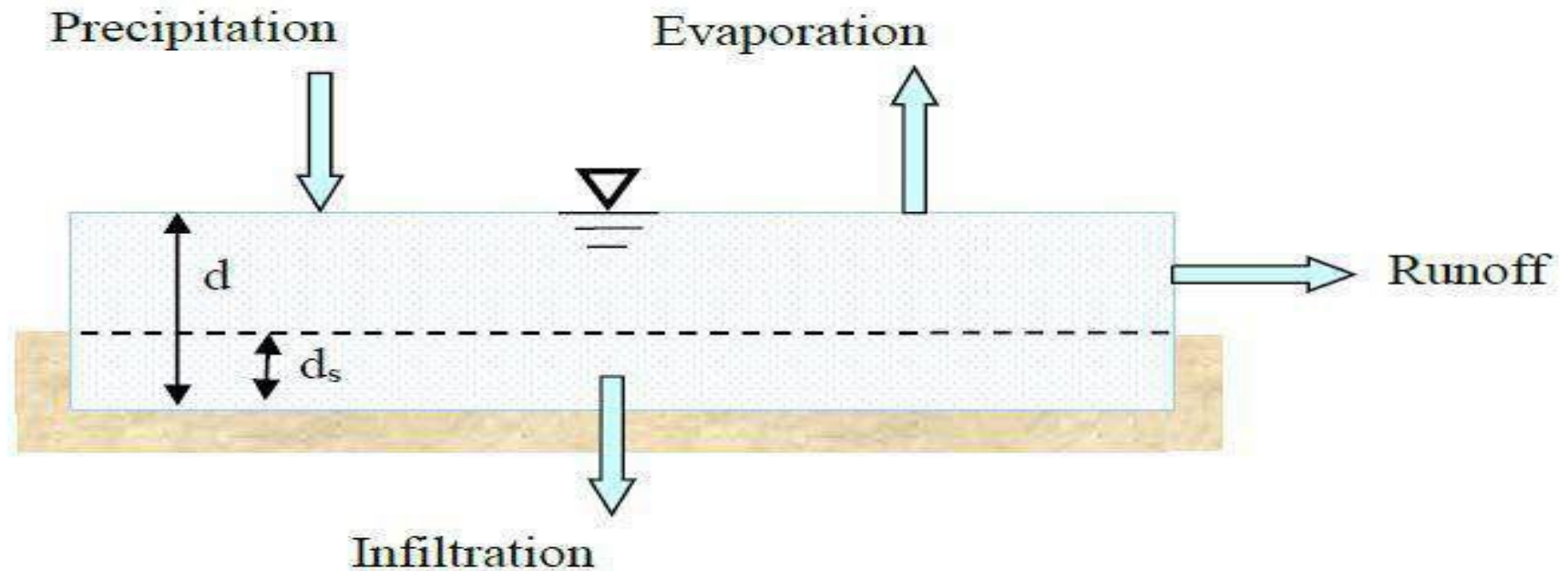
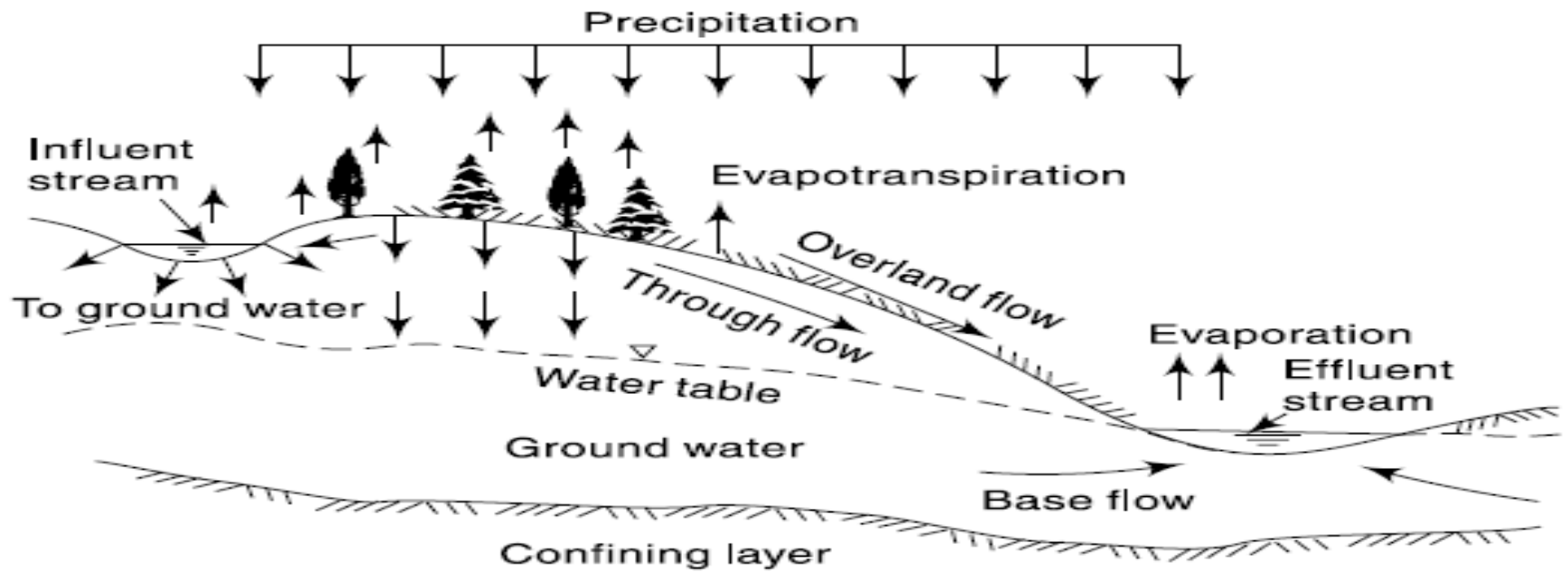








Different routes of runoff/Nonlinear reservoir model



INTRODUCTION

To protect the urban areas against flooding in a phased manner, consistent with availability of resources, storm water drainage systems need to be planned and implemented in structured manner considering various aspects of design, operation & maintenance and economics. This essentially spells out the need for the formulation of this National Manual containing aspects of planning, rainfall analysis, designing, detailed engineering of facilities, construction, as well as, operation & maintenance of urban storm water drainage systems including rehabilitation and refurbishing of prevailing under-performing drainage systems.

INTRODUCTION

The natural drainage systems in most of the cities are in jeopardy, and the problem of flooding is worsening with time due to non-availability of properly engineered storm water drainage infrastructures. The problems are exacerbated due to encroachment and rampant dumping of garbage & solid waste in the drains on one hand and absence of preventive maintenance on the other.

INTRODUCTION

- **Drainage** is the process of interception and removal of water from over, and under the vicinity.

TYPES OF DRAINAGE

- Subsurface drainage
- Surface drainage
- Cross drainage

Desilting /Dredging of Rivers

The studies carried out so far indicate aggradation/degradation of riverbeds in certain reaches, but they do not confirm the common belief of a general rise in river beds. Silting at places where the rivers emerge from the hills into the plains, at convex bends and near their outfall into another river or lake or sea, is a natural phenomenon. Accordingly, rivers exhibit a tendency to braid/meander/form deltas. Various committees/experts appointed to look into this problem have not recommended desilting/dredging of the rivers as a remedial measure. Selective desilting/dredging at outfalls/confluences or local reaches can, however, be adopted as a measure to tackle the problem locally.

Drainage system blocked







Identification of storm drainage related problems within urban areas that may warrant further detailed investigations and planning such as:

- Littering, garbage, domestic wastes, plastic waste, etc.
- Solid waste points nearer to the drainage system
- Nearby dump site status
- Natural pollution, such as leaves, etc.
- Chemical pollution, such as detergents, oil or fertilizers

Planning of Storm Water Drainage Systems

- ❖ **Demarcation of Catchment and Planning Areas**
- ❖ **Hydraulic Design of Storm Water Drainage Systems**
- ❖ **Inlet locations**
- ❖ **Manholes (MHs) and its locations**
- ❖ **Pumping of storm runoff**
- ❖ **Outfall Structures**
- ❖ **Other Considerations**
 - (i) **Permissions and Clearances**
 - (ii) **Environmental Consideration**

Financing-

- i. **Capital Cost**
- ii. **Operation & Maintenance**

3. Citizen Awareness

4. Institutional Arrangement and Capacity Building

- **Proposed Project and detailed design**

- i. Topographical survey of the project area and types & area of different surfaces in the project area.
- ii. Contour plans, Location of outfall structures.
- iii. GIS map for storm water drainage system
- iv. Rainfall data (intensity duration) for a long period not less than 25 years, preferably more years.
- v. Frequency analysis for design storms as recommended for the project area.
- vi. The proposed network of surface drains or subsurface drains drawn on the map showing location of manholes and street inlets, catchment/ basin, etc. The network of surface drains is proposed considering Service level benchmarking.
- vii. Design of proposed drain either manually or by aid of computer software.
- viii. A brief description of each component of project should be given with relevant maps and drawings
- ix. Function, location, design criteria, and capacity of each component should be provided.
- x. Description of the technical integration of the existing drainage system, if any, with the proposed project. In case the existing system is unworkable, suggest means either to improve or rehabilitate, if feasible.
- xi. Technical specification and performance specifications should be clearly defined and recorded.
- xii. Phasing out year-wise work schedule to achieve required service levels with respect to coverage and nil incidence of flooding and correlate its improvement.

- **Environmental Impact Assessment**

Environmental Impact Assessment (EIA) Study and Social Study should be done for the construction and post-construction period. Adverse effect shall be examined and suggestion for remedial measures will be provided if any.

- **Cost Estimation**

- **Implementation Schedule**

- **Conclusions and Recommendations**

Hydraulically Efficient Channel Section

The conveyance of a channel section of a given area increases with a decrease in its perimeter. Hence a channel section having the minimum perimeter for a given area of flow provides the maximum value of the conveyance. With the slope, roughness coefficient and area of flow fixed, a minimum perimeter section will represent the hydraulically efficient section as it conveys the maximum discharge. This channel section is also called the best section.

Proportions of Some Most Efficient Sections

Sl. No.	Channel Shape	Area (A_e)	Wetted Perimeter (P_e)	Width (B_e)	Hydraulic Radius (R_e)	Top width (T_e)	$\frac{Q_n}{y_e^{8/3} S_0^{1/2}} = K_e$
1.	Rectangle (Half square)	$2Y_e^2$	$4Y_e$	$2Y_e$	$\frac{Y_e}{2}$	$2Y_e$	1.260
2.	Trapezoidal (Half regular hexagon, $m = \frac{1}{\sqrt{3}}$)	$\sqrt{3}Y_e^2$	$2\sqrt{3} Y_e$	$\frac{2}{\sqrt{3}} Y_e$	$\frac{Y_e}{2}$	$\frac{4Y_{ec}}{\sqrt{3}}$	1.091
3.	Circular (semi-circular)	$\frac{\pi}{2} Y_e^2$	πY_e	$D = 2Y_e$	$\frac{Y_e}{2}$	$2Y_e$	0.9895
4.	Triangle (Vertex angle-90°)	Y_e^2	$2\sqrt{3} Y_e$	-	$\frac{Y_e}{2\sqrt{2}}$	$2Y_e$	0.500

Where,

- ❖ e subscript denotes most efficient
- ❖ Y_e is the depth of flow for most efficient section
- ❖ Q_n is discharge
- ❖ S_0 is bed slope

Design flow

Storm water drains are designed taking into account the peak flow. The peak flow is defined as the flow when the entire catchment is contributing at its outlet. This will occur when the given intensity of rainfall begins instantaneously and continues till the time of concentration.

Procedure for estimation of runoff

If properly understood and applied, the 'rational method' can produce satisfactory results for sizing storm drains, street inlets and small on-site detention catchments. The formula for calculating design flow is given as below:

$$Q = 10 C I A$$

Where,

Q : Peak flow at the point of design, m³/hr

C : Runoff coefficient, dimensionless

I : Average rainfall intensity should be taken for the duration of rainfall equal to the time of concentration, mm/hr

A : Catchment area, hectares

This formula is dimensionally consistent to other measurement systems.

Although this method is widely used in storm water drainage design, the estimation of runoff involves the following assumptions:

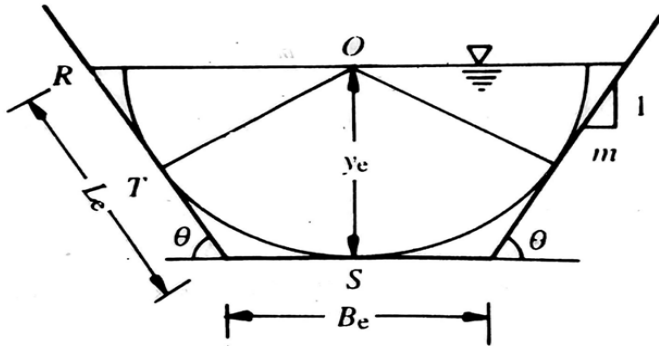
- a) The maximum size of a catchment should be between 8 to 10 sq km.
- b) Larger catchments can be sub-divided into smaller sub-catchments.
- c) The peak flow occurs when the entire catchment is contributing to the flow;
- d) The rainfall intensity is uniform over the entire catchment;
- e) The rainfall intensity is uniform over a time duration equal to the time of concentration;
- f) The frequency of the computed peak flow is the same as that of the rainfall intensity corresponding to the return period of the 'design storm';
- g) The coefficient of runoff is the same for all storms of all recurrence probabilities.

Recommended Design Return Period for various types of urban catchments

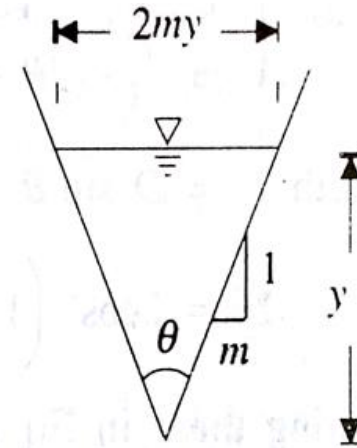
S. No.	Urban Catchment	Return Period	
		Mega Cities	Other cities
1.	Central Business and commercial	Once in 5 years	Once in 2 years
2.	Industrial	Once in 5 years	Once in 2 years
3.	Urban Residential Core Area, Peripheral Area	Once in 5 years Once in 2 years	Once in 2 years Once in 1 years
4.	Open space, Parks and landscape	Once in 6 months	Once in 6 months
5.	Airports and other critical infrastructure*	Once in 100 years	Once in 50 years

Different type of Section

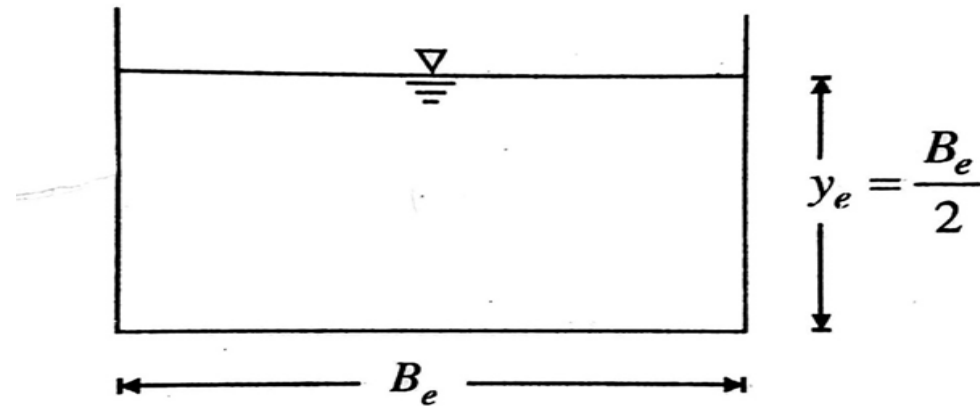
Trapezoidal Section



Triangular Section, $\theta = 90$ degree

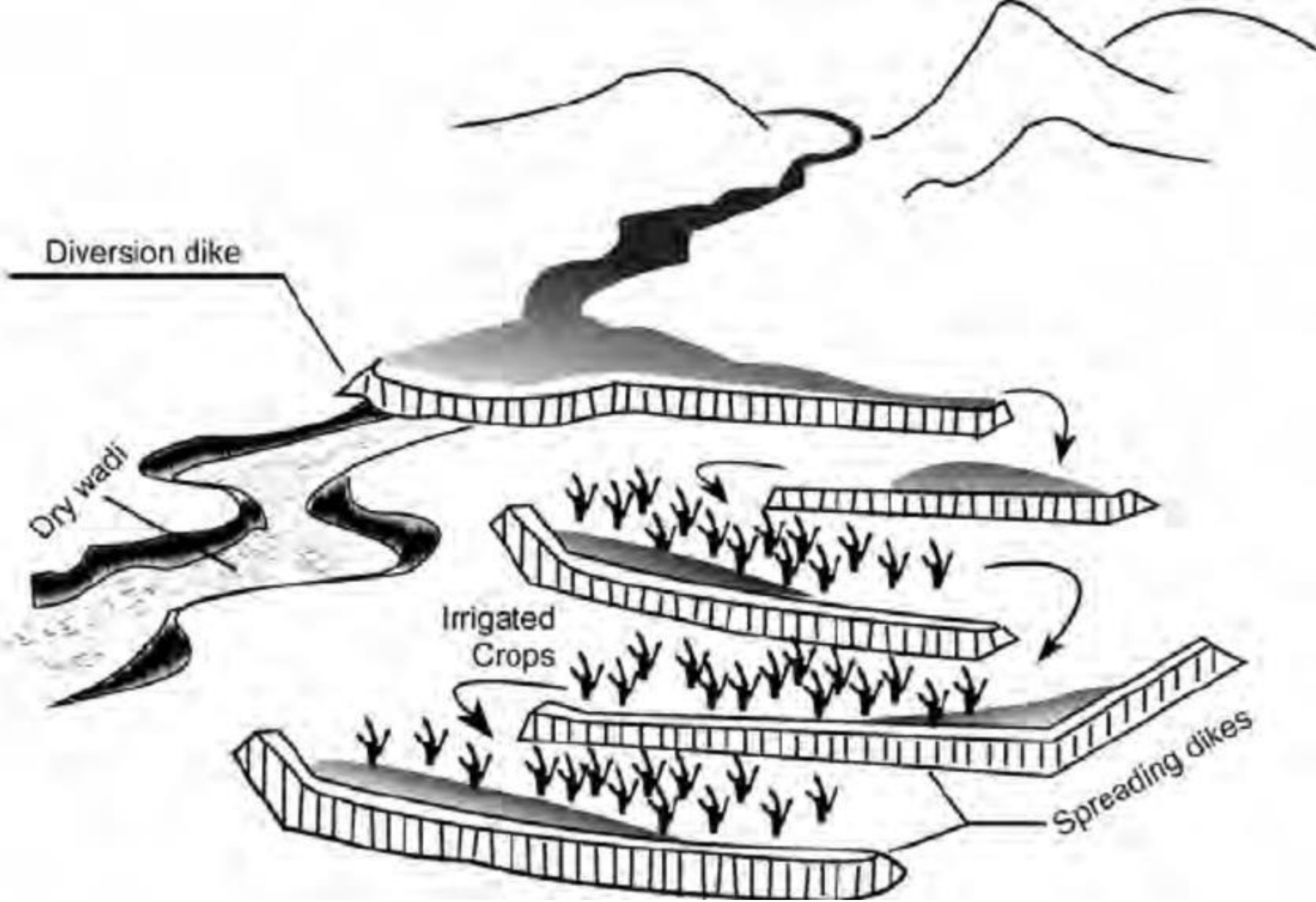


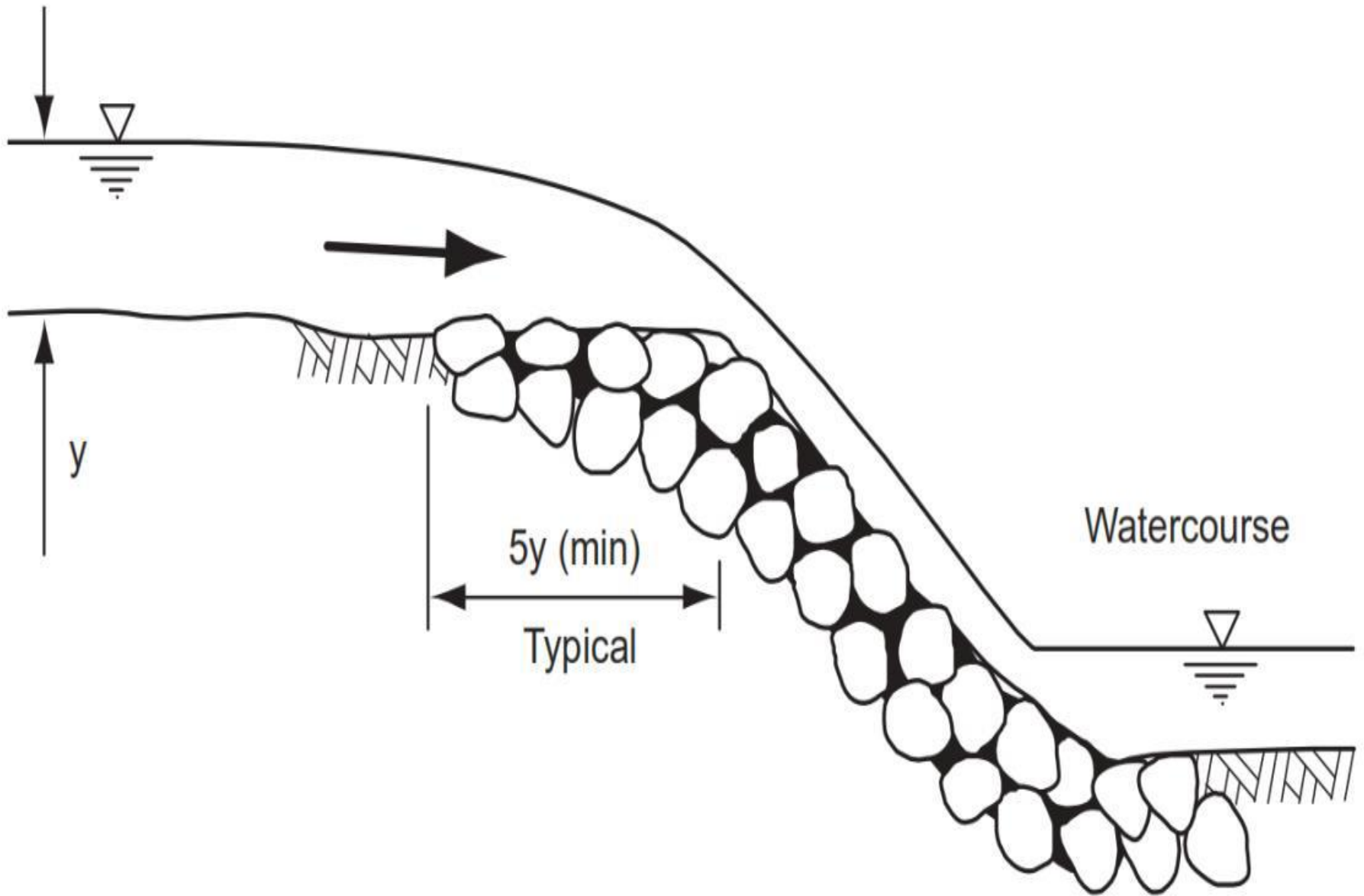
Rectangular Section





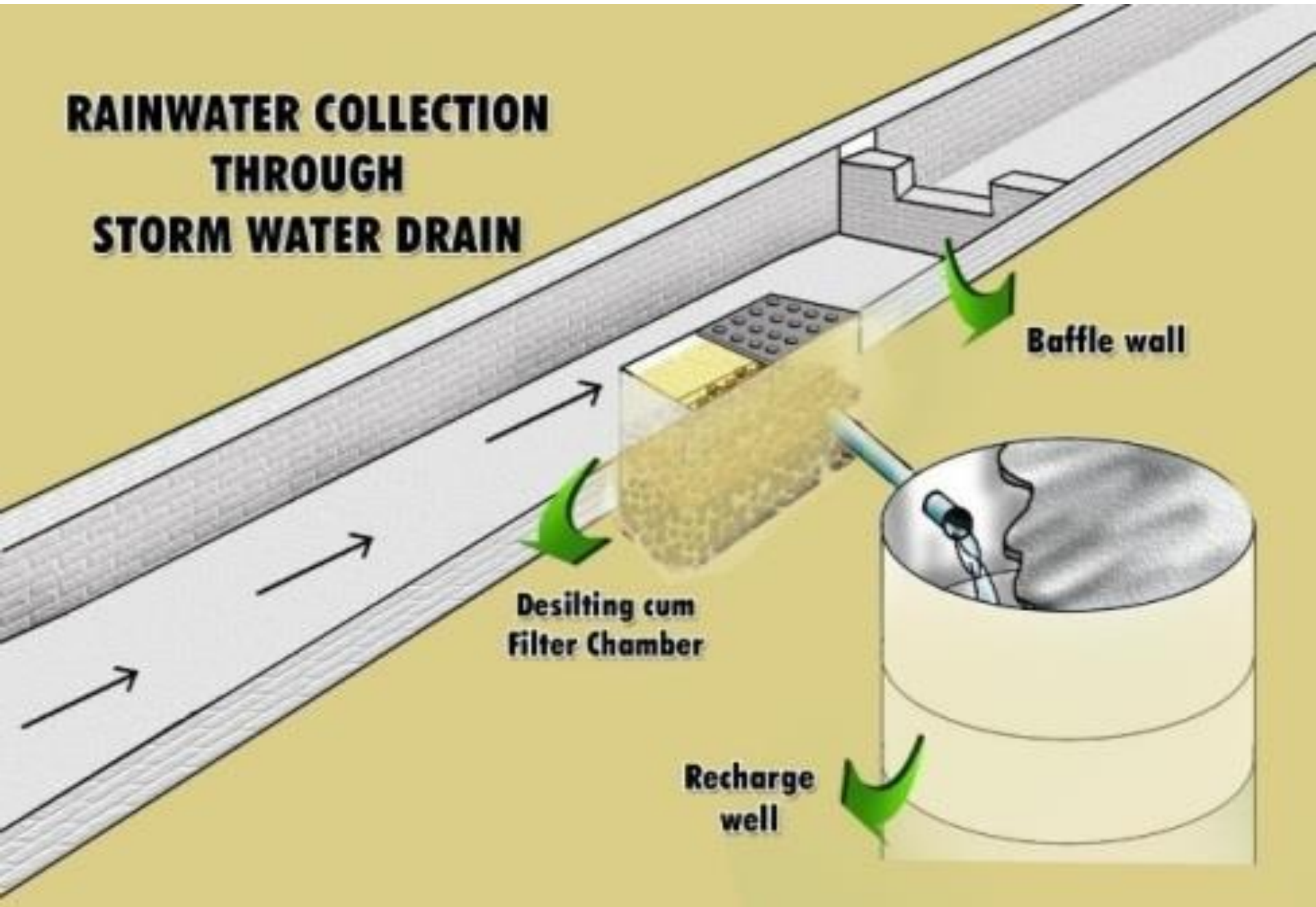
The storm drainage system should be designed in an environmentally responsible manner to minimize disruption of the natural environment of the city natural streams/waterways. Engineered waterways/channels are preferred means of meeting the objective by providing a drainage system that more closely resembles natural streams/waterways. These channels are components of the major drainage system designed to collect and convey flows from minor drainage system. The following sections discuss the design guidelines for engineered channels as well as modified natural channels.





Storm Water channel outfall

RAINWATER COLLECTION THROUGH STORM WATER DRAIN



Rain water collection through storm water drains



Box drain

Need for Operation and Maintenance

The lack of attention to the important aspect of O & M leads to deterioration of the useful life of the system necessitating premature replacement of many system components. As such, even after creating the assets by investing millions of rupees, they are unable to provide the services effectively to the community for which they have been constructed.

Some of the key issues contributing to the poor O&M are as follows:

1. Lack of finance and inadequate data on O&M
2. Multiplicity of agencies, overlapping in their responsibilities
3. Inadequate training of personnel
4. Non-availability of operation & maintenance manuals.
5. Lack of awareness of the importance of storm drainage facilities by the community.
6. Lack of Management Information system and real time field information

Therefore, there is a need of exclusive Operation & Maintenance Manual for storm water drainage system.

Type of Maintenance

The drainage system is at its best, when it is maintained properly as designed. For this purpose, it is necessary that the drains keep their shape and slope in the designed manner during their life time. It is also necessary to ensure that the drains retain their full cross section, particularly during monsoons. The system of maintenance can be classified into following three categories.

- a) Continuous regular maintenance
- b) Periodical maintenance
- c) Special maintenance/Repairs for improvement

Hilly Terrain

Hilly areas are characterized with high terrain slope. In case of a storm, the runoff gushes down the hill at very high velocities causing erosion of soil along drains/slopes. The amount and size of soil particles transported, increase the volume and velocity of runoff and are subsequently carried along drainage system of the basin to the receiving bodies e.g., river and stream.

Impact of Erosion and Sedimentation on performance of storm water drains

On steeper slopes, water moves faster as compared to flatter slopes and this increased flow velocity aided by a lack of significant vegetative cover results in transportation of larger amount of sediments. The increasing urbanization of hilly areas increases the paved surfaces and results in increased surface runoff, further aiding the transport of eroded sediments. Deposition of such eroded sediments inflicts serious problems in the drainage channels in the areas located downstream of it resulting in frequent flooding. Rapid downward movement of sediment-laden water can cause problems like landslides that frequently occur during monsoon almost in most of the hilly towns, causing loss of lives and damage to property. Therefore, the interlinked consequences of urban development are transforming the hilly urban watersheds into multi-hazard zones. Protecting erosion and prevention of sedimentation is extremely important in planning and design of urbanization in hilly areas. The following section mentions about the considerations to be adopted in the design of storm water drains to mitigate the issue of erosion and sedimentation.

The slip of 1867 from the Sherkadanda Hill necessitated examination of the hill sides by committees of Engineers in 1867 and 1873 who recognized the action of water as the chief cause in bringing about slips in the peculiar formation of the hills around Nainital in which the natural conditions were favourable to slips. They recommended measures for dealing with drainage and for supporting the hill slopes at bad places by walls, etc.



A Committee convened in 1883 to inquire into the condition of old Govt. House was of opinion that the cracks through the house had resulted from the general disturbance of the hill in 1880.

1. The orders which led to the submission of an annual hillside report for Naini Tal is contained in letter no. C.1635-B.B., dated July 15, 1890, from the Under Secretary to Govt. North Western Provinces and Oudh, Public Works Department, Buildings and Roads branch to the Superintending Engineer, II Circle, an extract from which is given below:-

2. The Executive Engineer, Kumaun and the District Engineer, Tarai should take suitable opportunities to keep themselves well informed of the state of these hills from time to time.



NATURAL WATER DRAINAGE SYSTEM OF NAINITAL LAKE & SUKHATAL

SCALE - 1 : 500
 DATE 10 / 02-03/03
 DATE 14/07/18

LEGEND:
 MAIN ROAD ——— MAIN ROAD
 ROYAL ROAD ——— ROYAL ROAD

AGENCY:
 IRRIGATION DEPARTMENT OF NAINITAL
 TALLITAL, NAINITAL, UTTARAKHAND - 263002
 TEL: 019-407761206

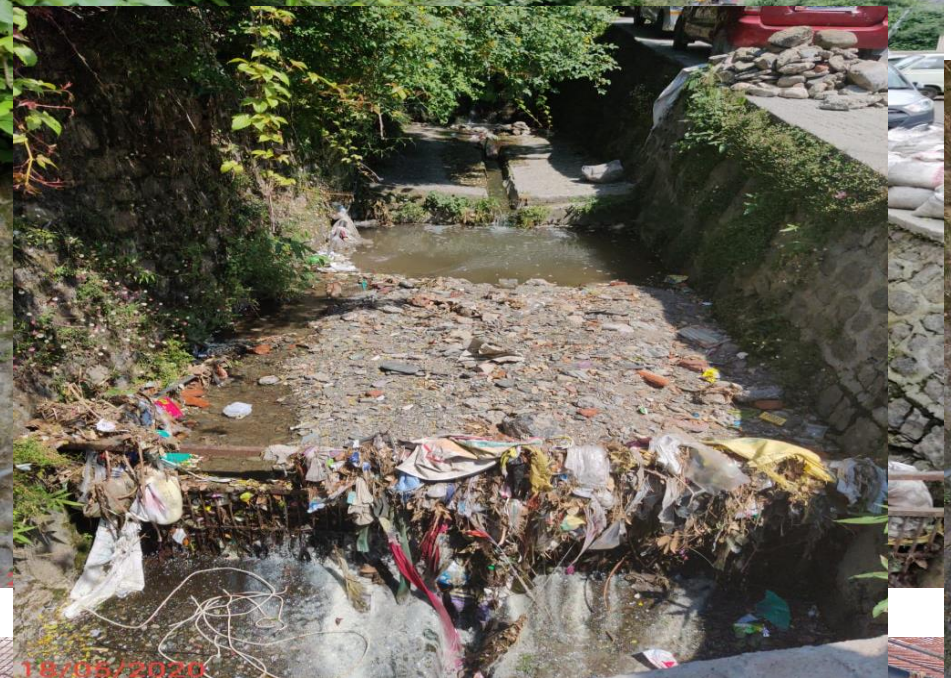
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 J-3032, GALLODA, DDA PLATS, NEW DELHI - 110 018
 TEL: 011-26106006, 011-40510004

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Operation & Maintenance

For any system to operate in a proper and efficient manner, the key is its appropriate and planned regular and preventive operation and maintenance.

IRRIGATION DIVISION NAINITAL Nainital Drainage System by Irrigation Department



Nainital Drainage System by Irrigation Department



10.10.2020

10.10.2020

Nainital Drainage System by Irrigation Department

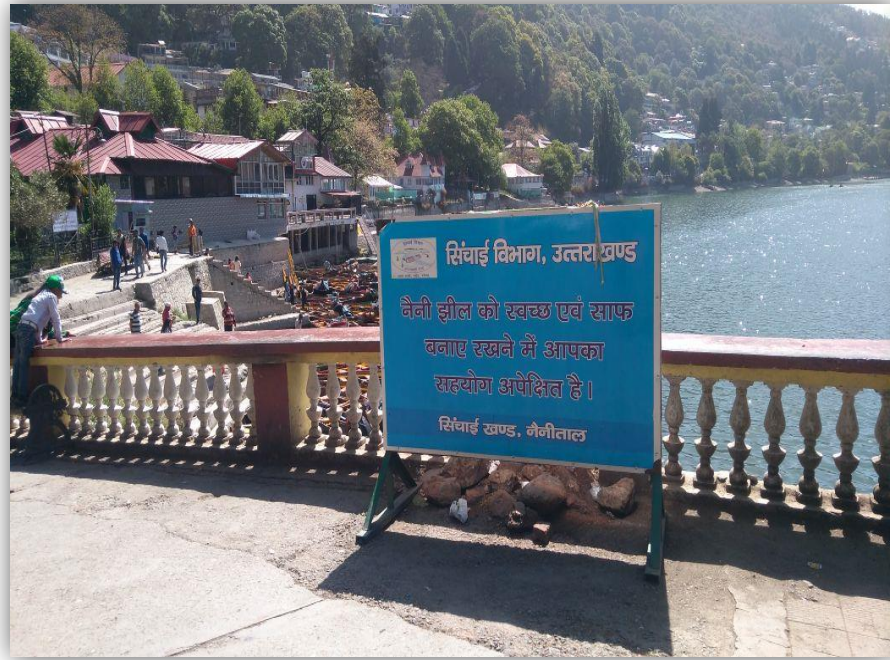


Encroachment in storm water drains



Citizen Awareness

Citizen awareness is the growing recognized mechanism to dissuade people from the habit of indiscriminate littering and dumping of debris and solid waste either on open ground or nearby rivers/streams/lakes/drains.



Institutional Arrangement

-:आदेश:-

Conservation, Remedial and Management Measures for Nainital Lake, हेतु विभिन्न विभागों द्वारा निम्नवत् कार्य कराये जाने के आदेश एतद्वारा निर्गत किये जाते हैं।

क्रम सं०	विभाग का नाम	किये जाने वाले कार्य
1	सिंचाई विभाग	सूखाताल झील, नैनी झील और इससे सम्बन्धित 62 संख्या नालों के निर्माण एवं रखरखाव का कार्य, नियामक प्रणाली, झील के जल स्तर, गुणवत्ता इत्यादि की प्रदर्शन प्रणाली, आउटलेट गेट आपरेशन के लिये फॉर्मूलेशन दिशा निर्देश, नालों में पानी के अनबन्धित प्रवाह के लिये प्राकृतिक मलबे की साफ-सफाई का कार्य।
2	जल संस्थान	जल संरक्षण उपाय, नीति, कानून और टैरिफ (जिला प्रशासन/राज्य सरकार के परामर्श से) कुशल उपकरणों का उपयोग, जल आपूर्ति का समय निर्धारण, जन जागरूकता इत्यादि, शहर में स्थित भवनों के वर्षा जल का सीवर लाईन से विच्छेदित करना और उसे मुख्य नालों में जोड़ना, झील के जल की गुणवत्ता जांच एवं नियंत्रण कार्य।
3	जल निगम	तृतीयक स्तर सीवेज (tertiary level sewage treatment) उपचार संयंत्रों का निर्माण और रखरखाव और नालों में treated effluent का निस्तारण।
4	लोक निर्माण विभाग	पाकिंग स्थल का निर्माण (जिला प्रशासन और नगर पालिका परिषद के परामर्श से) सड़कों का सुचारु संचालन एवं रखरखाव, पुलों, कल्वर्टों, रोड साईड ड्रेनों इत्यादि एवं उससे सम्बन्धित संरचनाओं का संचालन, साफ-सफाई एवं रखरखाव का कार्य।
5	जिला विकास प्राधिकरण	अनधिकृत निर्माण पर प्रतिबन्ध, नालों में निर्माण मलबे के निस्तारण पर पूर्ण प्रतिबन्ध, रोकथाम एवं इसके समुचित निस्तारण की व्यवस्था।
6	वन विभाग	कैचमेन्ट एरिया ट्रीटमेन्ट एवं रेन वाटर हारवेस्टिंग, कैचमेन्ट में मिट्टी के कटाव की रोकथाम, वेटलैण्ड की अधिसूचना निर्गत करने इत्यादि का कार्य।
7	नगर पालिका परिषद	नालों में घरेलू कचरे के निस्तारण पर पूर्ण प्रतिबन्ध, रोकथाम एवं इसके समुचित निस्तारण की व्यवस्था। नैनी झील की साफ-सफाई, ठोस अपशिष्ट प्रबन्धन एवं सार्वजनिक सुविधाओं का समुचित प्राविधान एवं प्रबन्धन इत्यादि।

उक्त आदेश तत्काल प्रभावी होंगे।

-SD-

(राजीव रौतेला)

आई०ए०एस०

आयुक्त कुमाऊँ/अध्यक्ष
हिल साईड सेपटी कमेटी
नैनीताल

कार्यालय अधिशासी अभियन्ता
सिंचाई खण्ड नैनीताल

पत्रांक 3197 / सिखनै / नैनी झील / दिनांक 5.10.2018
प्रतिलिपि आयुक्त महोदय कुमाऊँ/अध्यक्ष हिल साईड सेपटी कमेटी, नैनीताल को सादर अवलोकनाथ प्रेषित।

(एच०सी० सिंह)

अधिशासी अभियन्ता

कार्यालय अधिशासी अभियन्ता
सिंचाई खण्ड नैनीताल

पत्रांक 3197 / सिखनै / नैनी झील / दिनांक 5.10.2018।
प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित:-

1. जिलाधिकारी, नैनीताल।
2. प्रभागीय वनाधिकारी, वन प्रभाग नैनीताल।
3. सचिव जिला विकास प्राधिकरण, नैनीताल।
4. अधिशासी अभियन्ता जल संस्थान, नैनीताल/जल निगम भीमताल/प्रान्तीय खण्ड, लोक निर्माण विभाग, नैनीताल।
5. अधिशासी अधिकारी, नगर पालिका परिषद, नैनीताल।

(एच०सी० सिंह)

अधिशासी अभियन्ता

Public Information

—:आदेश:—

Conservation, Remedial and Management Measures for Nainital lake, के अन्तर्गत sewage treatment plant की भूमि उपलब्धता हेतु Hill Side Safety Committee, Nainital की बैठक दिनांक 27 अगस्त, 2019 के विनिश्चय के क्रम में officials & non officials members की समिति निम्नानुसार गठित किये जाने के आदेश एतद्वारा निर्गत किये जाते हैं।

1. अधिशासी अभियन्ता, पेयजल निगम, नैनीताल (भीमताल)
2. प्रभागीय वनाधिकारी, वन प्रभाग नैनीताल
3. अधिशासी अभियन्ता, सिंचाई खण्ड, नैनीताल
4. अधिशासी अभियन्ता, जल संस्थान नैनीताल
5. अधिशासी अभियन्ता प्रान्तीय खण्ड, लो0नि0वि0 नैनीताल
6. उपजिलाधिकारी, नैनीताल
7. अधिशासी अधिकारी, नगर पालिका परिषद, नैनीताल
8. प्रो0 अजय रावत, पर्यावरणविद्
9. श्री आलोक साह, होटल एसोसियेशन
10. श्री राजीव लोचन साह, सम्पादक, नैनीताल समाचार
11. श्रीमती शान्ती मेहरा, नैनीताल
12. श्री सुहृद सुदर्शन साह, अध्यक्ष पर्यावरण प्रबोधिनी, डैवलपमेन्ट सोसाईटी, नैनीताल
13. श्री रवि पाण्डे, पत्रकार हिन्दुस्तान
14. प्रो0 (रिटायर्ड) जी0एल0 साह, नैनीताल
15. श्री नीरज जोशी, अध्यक्ष टैक्सी यूनियन
उक्त आदेश तत्काल प्रभावी होंगे।

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(राजीव रौतेला)
आई0ए0एस0
आयुक्त कुमार्ज / अध्यक्ष
हिल साईड सेफ्टी कमेटी
नैनीताल

कार्यालय अधिशासी अभियन्ता
सिंचाई खण्ड नैनीताल

पत्रांक 3673 / सिखनै / नैनी झील / दिनांक 03/10/2019

प्रतिलिपि आयुक्त महोदय कुमार्ज / अध्यक्ष हिल साईड सेफ्टी कमेटी, नैनीताल को सादर अवलोकनार्थ प्रेषित।

~~(एच0सी0 सिंह)~~

अधिशासी अभियन्ता

कार्यालय अधिशासी अभियन्ता
सिंचाई खण्ड नैनीताल

पत्रांक 3673 / सिखनै / नैनी झील / दिनांक 03/10/2019

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित:-

1. जिलाधिकारी, नैनीताल।
2. अधिशासी अभियन्ता, पेयजल निगम, नैनीताल (भीमताल)।
3. प्रभागीय वनाधिकारी, वन प्रभाग नैनीताल।
4. अधिशासी अभियन्ता, जल संस्थान नैनीताल।
5. अधिशासी अभियन्ता प्रान्तीय खण्ड, लो0नि0वि0 नैनीताल।
6. उपजिलाधिकारी, नैनीताल।
7. अधिशासी अधिकारी, नगर पालिका परिषद, नैनीताल।
8. प्रो0 अजय रावत, पर्यावरणविद्।
9. श्री आलोक साह, होटल एसोसियेशन।
10. श्री राजीव लोचन साह, सम्पादक, नैनीताल समाचार।
11. श्रीमती शान्ती मेहरा, नैनीताल।
12. श्री सुहृद सुदर्शन साह, अध्यक्ष पर्यावरण प्रबोधिनी, डैवलपमेन्ट सोसाईटी, नैनीताल।
13. श्री रवि पाण्डे, पत्रकार हिन्दुस्तान।
14. प्रो0 (रिटायर्ड) जी0एल0 साह, नैनीताल।
15. श्री नीरज जोशी, अध्यक्ष टैक्सी यूनियन।

(एच0सी0 सिंह)

अधिशासी अभियन्ता

—:आदेश:—

Conservation, Remedial and Management Measures for Nainital lake, के अन्तर्गत नैनीताल शहर की सफाई व्यवस्था में सुधार लाने के दृष्टिगत lake warden की व्यवस्था को लागू करने एवं जन जागरूकता अभियान हेतु Hill Side Safety Committee, Nainital की बैठक दिनांक 27 अगस्त, 2019 के विनिश्चय के क्रम में officials & non officials members की समिति निम्नानुसार गठित किये जाने के आदेश एतद्वारा निर्गत किये जाते हैं।

- | | |
|---|----------|
| 1. अधिशासी अधिकारी, नगर पालिका परिषद, नैनीताल | — संयोजक |
| 2. प्रो० अजय रावत, पर्यावरणविद् | — सदस्य |
| 3. श्री आलोक साह, होटल एसोसियेशन | — सदस्य |
| 4. श्री राजीव लोचन साह, सम्पादक, नैनीताल समाचार | — सदस्य |
| 5. श्रीमती शान्ती मेहरा, नैनीताल | — सदस्य |
| 6. श्री सुहृद सुदर्शन साह, अध्यक्ष पर्यावरण प्रबोधिनी, डैवलपमेंट सोसाईटी, नैनीताल | — सदस्य |
| 7. श्री रवि पाण्डे, पत्रकार हिन्दुस्तान | — सदस्य |
| 8. श्री दिनेश साह, अध्यक्ष होटल एसोसियेशन | — सदस्य |
| 9. प्रो० (रिटायर्ड) जी०एल० साह, नैनीताल | — सदस्य |
| 10. श्री नीरज जोशी, अध्यक्ष टैक्सी यूनियन | — सदस्य |

उक्त आदेश तत्काल प्रभावी होंगे।

-SD-

(राजीव रौतेला)
आई०ए०एस०
आयुक्त कुमार्ज / अध्यक्ष
हिल साईड सेफ्टी कमेटी
नैनीताल

कार्यालय अधिशासी अभियन्ता
सिंचाई खण्ड नैनीताल

पत्रांक 3674 / सिखनै / नैनी झील / दिनांक 03/10/2019

प्रतिलिपि आयुक्त महोदय कुमार्ज / अध्यक्ष हिल साईड सेफ्टी कमेटी, नैनीताल को सादर अवलोकनार्थ प्रेषित।

(एच०सी० सिंह)
अधिशासी अभियन्ता

कार्यालय अधिशासी अभियन्ता
सिंचाई खण्ड नैनीताल

पत्रांक 3674 / सिखनै / नैनी झील / दिनांक 03/10/2019

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित:-

1. जिलाधिकारी, नैनीताल।
2. अधिशासी अधिकारी, नगर पालिका परिषद, नैनीताल।
3. प्रो० अजय रावत, पर्यावरणविद्।
4. श्री आलोक साह, होटल एसोसियेशन।
5. श्री राजीव लोचन साह, सम्पादक, नैनीताल समाचार।
6. श्रीमती शान्ती मेहरा, नैनीताल।
7. श्री सुहृद सुदर्शन साह, अध्यक्ष पर्यावरण प्रबोधिनी, डैवलपमेंट सोसाईटी, नैनीताल।
8. श्री रवि पाण्डे, पत्रकार हिन्दुस्तान।
9. श्री दिनेश साह, अध्यक्ष होटल एसोसियेशन।
10. प्रो० (रिटायर्ड) जी०एल० साह, नैनीताल।
11. श्री नीरज जोशी, अध्यक्ष टैक्सी यूनियन।

(एच०सी० सिंह)
अधिशासी अभियन्ता

—:आदेश:—

Conservation, Remedial and Management Measures for Nainital lake, के अन्तर्गत नैनीताल, सूखाताल झील में आने वाले विभिन्न विलुप्त हुए नालों की मैपिंग किये जाने हेतु Hill Side Safety Committee, Nainital की बैठक दिनांक 27 अगस्त, 2019 के विनिश्चय के क्रम में officials & non officials members की समिति निम्नानुसार गठित किये जाने के आदेश एतद्वारा निर्गत किये जाते हैं।

1. अधिशासी अभियन्ता, सिंचाई खण्ड, नैनीताल
2. अधिशासी अभियन्ता, प्रान्तीय खण्ड, लो0नि0वि0 नैनीताल
3. प्रभागीय वनाधिकारी, नैनीताल
4. उपजिलाधिकारी, नैनीताल
5. अधिशासी अधिकारी, नगर पालिका परिषद, नैनीताल
6. प्रो0 अजय रावत, पर्यावरणविद्
7. श्री आलोक साह, होटल एसोसियेशन
8. श्री राजीव लोचन साह, सम्पादक, नैनीताल समाचार
9. श्रीमती शान्ती मेहरा, नैनीताल
10. श्री सुहृद सुदर्शन साह, अध्यक्ष पर्यावरण प्रबोधिनी, डैवलपमेंट सोसाईटी, नैनीताल
11. श्री रवि पाण्डे, पत्रकार हिन्दुस्तान
12. श्री दिनेश साह, अध्यक्ष होटल एसोसियेशन
13. प्रो0 (रिटायर्ड) जी0एल0 साह, नैनीताल

- संयोजक सदस्य
- सदस्य
- सदस्य
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- सदस्य

उक्त आदेश तत्काल प्रभावी होंगे।

-SD-

(राजीव रौतेला)
आई0ए0एस0
आयुक्त कुमार्क / अध्यक्ष
हिल साईड सेफ्टी कमेटी
नैनीताल

कार्यालय अधिशासी अभियन्ता
सिंचाई खण्ड नैनीताल

पत्रांक 3675 / सिखनै / नैनी झील / दिनांक 03/10/2019

प्रतिलिपि आयुक्त महोदय कुमार्क / अध्यक्ष हिल साईड सेफ्टी कमेटी, नैनीताल को सादर अवलोकनार्थ प्रेषित।

(एच0सी0 सिंह)
अधिशासी अभियन्ता

कार्यालय अधिशासी अभियन्ता
सिंचाई खण्ड नैनीताल

पत्रांक 3675 / सिखनै / नैनी झील / दिनांक 03/10/2019

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित:—

1. जिलाधिकारी, नैनीताल।
2. अधिशासी अभियन्ता, प्रान्तीय खण्ड, लो0नि0वि0 नैनीताल।
3. प्रभागीय वनाधिकारी, नैनीताल।
4. उपजिलाधिकारी, नैनीताल।
5. अधिशासी अधिकारी, नगर पालिका परिषद, नैनीताल।
6. प्रो0 अजय रावत, पर्यावरणविद्।
7. श्री आलोक साह, होटल एसोसियेशन।
8. श्री राजीव लोचन साह, सम्पादक, नैनीताल समाचार।
9. श्रीमती शान्ती मेहरा, नैनीताल।
10. श्री सुहृद सुदर्शन साह, अध्यक्ष पर्यावरण प्रबोधिनी, डैवलपमेंट सोसाईटी, नैनीताल।
11. श्री रवि पाण्डे, पत्रकार हिन्दुस्तान।
12. श्री दिनेश साह, अध्यक्ष होटल एसोसियेशन।
13. प्रो0 (रिटायर्ड) जी0एल0 साह, नैनीताल।

(एच0सी0 सिंह)

SECTION OF A RECTANGULAR DRAIN







Cleaning of Saritatal

Do's and Don'ts for Community

The public are also responsible to help maintain the system and must not put solid wastes, vegetable cut bits, meat, plastics, etc, into the system. This is very well advertised by many ULB's, but the public continue to do so. Public awareness program needs to be regularly organized.

Do not dump waste in storm water drains /Do not litter on in storm water Inlet





एक कदम स्वच्छता की ओर

CLEANLINESS PLEDGE

Mahatma Gandhi dreamt of an India which was not only free but also clean and developed.
Mahatma Gandhi secured freedom for Mother India.

Now it is our duty to serve Mother India by keeping the country neat and clean.

I take this pledge that I will remain committed towards cleanliness and devote time for this.
I will devote 100 hours per year, that is two hours per week, to voluntarily work for cleanliness. I will neither litter nor let others litter.

I will initiate the quest for cleanliness with myself, my family, my locality, my village and my work place.

I believe that the countries of the world that appear clean are so because their citizens don't indulge in littering nor do they allow it to happen. With this firm belief, I will propagate the message of Swachh Bharat Mission in villages and towns.

I will encourage 100 other persons to take this pledge which I am taking today. I will endeavour to make them devote their 100 hours for cleanliness.

I am confident that every step I take towards cleanliness will help in making my country clean.

Do's

- Start cleanliness from home
- Keep surroundings clean and green
- Keep work place neat and clean
- Devote 2 hours a week on sanitation
- Dispose garbage in designated places.

Don'ts

- Don't litter and don't let others litter
- Don't defecate and urinate in open
- Don't deface public properties
- Don't spit in public places
- Don't dump garbage in drains/water bodies

THANK YOU