Supplementary tables

Supplementary Table 1. Equations used in the hydrological analysis of the Wadi Mehassar basin.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Formula | Description | Reference |
| 1 |  | Q = depth of direct runoff (mm); P = depth of precipitation for a specific return period (mm); S = potential maximum retention after runoff begins (mm); Ia = initial abstractions (amount of water before runoff such as infiltration, interception) (mm). | (USDA-TR, 1986) |
| 2 |  | (Gitika, et al., 2014) |
| 3 |  | (USDA-TR, 1986) |
| 4 |  | CN = a dimensionless curve number with a value ranging from 0 – 100. | (Mishra, et al., 2006; USDA-TR55, 1986) |
| 5 |  | CNS = composite curve number; CNi = curve number value of the sub-basin I; Ai = area of sub-basin I; A = total basin area; n = total number of sub-basins. | (McCuen, 1982) |
| 6 |  | TP = time until the peak (hour),  ∆t = duration of designed stormwater; TLAG= lag time (hour). | (NRCS, 1997) |
| 7 |  | T LAG: delay time (hour).  L: maximum distance of flow (m).  S: potential maximum retention (mm).  BS: average basin slope (%). | (NRCS, 1997) |
| 8 |  | Tc = time of concentration (hr); L = maximum flow distance (m); S = maximum flow distance slope (%). | (Anderson el al., 2002) |
| 9 |  | Qp = peak discharge (m3/s); A = basin area (km2); Q = depth of runoff (mm); Tp = time until the peak (hour). | (NRCS, 1997) |
| 10 |  | Qv = flood volume (m3); Q = direct runoff (mm); A = basin area (km2). | (USDA-TR55, 1986) |

Supplementary Table 2. The meteorological stations affecting Wadi Mehassar catchment area

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| station name | Periods | Longitude | Latitude | Source |
| Makkah Al-Mukaramah (J114) | 29 | 39°46'0"E | 21°26'0"N | General Presidency of Meteorology and Environmental Protection |
| Al-Sharae'a  (TA104) | 48 | 39°56'25"E | 21°29'42"N | Ministry of environment Water & Agriculture |
| Al-Farrain  (J113) | 38 | 40°7'0"E | 21°23'0"N | Ministry of Water and Electricity |

Supplementary Table 3. The expected depth of rainfall in different return periods at the metrological stations of Makkah Al-Mukaramah (J114), Al-Sharae'a (TA104), and Al-Farrain (J113)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Metrological Stations** | **Rainfall depths for different return periods within 24 h (mm)** | | | | | | | |
| **2** | **3** | **5** | **10** | **20** | **25** | **50** | **100** |
| Makkah Al-Mukaramah (J114) | 33.0 | 41.7 | 52.0 | 66.0 | 80.4 | 85.1 | 100 | 116 |
| Al-Sharae'a (TA104) | 35.4 | 46.8 | 60.3 | 78.0 | 95.8 | 102 | 120 | 139 |
| Al-Farrain (J113) | 29.5 | 43.6 | 61.4 | 85.5 | 110 | 117 | 141 | 166 |

Supplementary Table 4. Categories of land use/land cover units, hydrologic soil groups (HSG), CN values, area % and their spatial coverage in Wadi Mehassar basin.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#** | **LULC Categories** | **Hydrological Soil Group (HSG)** | | **Km2** | **%** |
| **B** | **D** |
| 1 | Mountains outcrops and bare Soils | 86 | 94 | 28.13 | 32.6 |
| 2 | Paved parking lots, roofs, driveways and roads | 98 | 98 | 20.75 | 24.0 |
| 3 | Alluvial deposits | 85 | - | 13.26 | 15.4 |
| 4 | Urban and built-up areas | 85 | 92 | 10.08 | 11.7 |
| 5 | Gravel boulders & detrital (weathered) sediments | 85 | 91 | 7.33 | 8.5 |
| 6 | Agricultural lands, grassland and Meadow | 58 | 78 | 4.08 | 4.7 |
| 7 | Barren land areas and open spaces | 79 | 89 | 2.67 | 3.1 |

Source: Groups of Runoff Curve Numbers -USDA, 1986 (Tables-2-a-b-c-d).

Supplementary Table 5. Flood hazard classifications to people (Ramsbottom et al. 2006)

|  |  |  |
| --- | --- | --- |
| Hazard Rate (m3/s) | Degree of flood hazard | Description |
| < 0.75 | Low | Caution |
| 0.75–1.5 | Moderate | Dangerous for some (i.e. children, elderly) |
| 1.5–2.5 | Significant | Dangerous for most people |
| > 2.5 | Extreme | Dangerous for all |