**Appendix: Notation**

|  |  |
| --- | --- |
| **Spatial quantities** | |
| *x,y,z* | Cartesian co-ordinates [L] |
| *t* | Time since the experiment began [T] |
|  | Initial time [T] |
| *ξ , ζ , η , τ* | Dummy variables corresponding to regular independent variables (x,y,z,t) |
| *T* | Time variable |
| *X* | Space variable |
|  |  |
| **Source geometry quantities** | |
| *a* | (Length of pollutant along y-direction)/*2* [L] |
| *W* | Width of source [L] |
| *H* | Thickness of source [L] |
| *h* | Injection width [L] |
|  | Length of aquifer [L] |
| *W´* | Domain width [L] |
| *X´* | x-x0 |
| *Y* | [-] |
|  | *2Y* [-] |
|  | Steady state plume length [L] |
| *X,Y* | and respectively – Chen et al (2016) |
| *l* | Length of longitudinal region 0 ≤ x ≤ l [L] |
|  |  |
| **Chemical reaction / Process quantities** | |
| *ED* | Electron donor |
| *EA* | Electron acceptor |
|  | Initial source concentration of the species at the origin (at *x=x0*) [ML-3] |
|  | Initial concentration of electron donor[ML-3] |
| *Ci* | Concentration of species i [ML-3] |
|  | Volume-averaged (resident) concentration [ML-3] – Batu and Van genuchten ( 1990) |
| *C’* | *C/C0* [-] |
| *λ´i* | A constant |
|  | *0, (π/8) , (2π/8), , , , , π* |
| *λ1* | */(a+y)* |
| *λ2* | */(a-y)* |
| *C0* | Initial concentration of solute (source conc.) (at *x=x0*) [ML-3] |
| *µ* | First order degradation factor [T-1] |
| *λ* | Decay constant [T-1] |
| *ki* | First-order decay rate constant of species i [T-1] |
| *yi* | The effective yield factor that describes the mass of a species i produced from species i-1 [MM-1] |
| *K* | Transfer coefficient [L-1] = *K\*/ De* [L-1] |
| *K\** | Mass transfer parameter [LT-1] |
| *Inverf()* | Inverse error function |
| *U* | [-] – Singh et al. (2009) |
| *T* | Time variable =[-] – Singh et al. (2009) |
| *T´* | – chen et al (2016) |
|  | – chen et al (2016) |
|  | – chen et al (2016) |
|  | – chen et al (2016) |
|  | An eigen value |
|  | First order decay term [T-1] – Sanskrityayn et al. (2017) |
| *, & g* | Non-dimensional expressions in (mt) – Sanskrityayn et al. (2017) |
| *M* | Injected pollute mass [ML-2] – Sanskrityayn et al. (2017) |
| *a* | Parameter for spatial dependence [L-1] – Sanskrityayn et al. (2017) |
| *m* | Parameter for temporal dependence [T-1] – Sanskrityayn et al. (2017) |
| *a´ & b´* | *a'* [T-1]and *b'* [LT-1] are so chosen such that -Purkayastha & Kumar (2018) |
| *D´0* | *a´2* –Purkayastha & Kumar (2018) |
| *v´0* | *a´-a´2* –Purkayastha & Kumar (2018) |
| *λ* | *a +*  –Purkayastha & Kumar (2018) |
| *X''* | –Purkayastha & Kumar (2018) |
| *α* | Dispersivity [L] |
| *αx* | Longitudinal dispersivity [L] |
| *αy* | Transverse horizontal dispersivity [L] |
| *αz* | Transverse vertical dispersivity [L] |
| *u* | Groundwater velocity in x-direction [LT-1] |
| *u0* | Initial ground water velocity in x-direction [LT-1] |
|  | Initial ground water velocity in y-direction [LT-1] |
| *w* | Downward pore water velocity in z-direction [LT-1] |
| *Dx* | Dispersion coefficient in x-direction [L2T-1] |
| *Dz* | Transverse dispersion coefficient [L2T-1] |
| *D0* | α u0 ( initial dispersion coefficient) [L2T-1] |
| *R* | Solute retardation factor [-] |
| *De* | Effective coefficient of molecular diffusion [L2T-1] |
| *Γ* | *k\*C0/ De* [ML-4] |
| *g(τ)* | A function [ML-3] |
| *&* | Auxiliary functions |
| *a’’* | [L-1] |
|  | – Kumar et al. (2010) |
|  | – Kumar et al. (2010) |
|  | – Kumar et al. (2010) |
|  | – Kumar et al. (2010) |
|  | – Kumar et al. (2010) |
|  | – Sanskrityayn et al. (2017) |
| ε | First order source decay constant [T-1] – Hunkeler et al. (2010) |
| *S* | Source term [ML-3] |
|  | Total aqueous concentration of species ED *=* – Hunkeler et al. (2010) |
|  | – Hunkeler et al. (2010) |
|  | – Hunkeler et al. (2010) |
|  | – Hunkeler et al. (2010) |
|  | – Hunkeler et al. (2010) |
|  | First order degradation rate constant [T-1] – Hunkeler et al. (2010) |
|  | – Hunkeler et al. (2010) |
|  | – Yadav and Jaiswal (2011) |
| *D* | – Yadav and Jaiswal (2011) |
|  | – Yadav and Jaiswal (2011) |
| *X''* | – Yadav and Jaiswal (2011) |
| *T''* | – Yadav and Jaiswal (2011) |
|  | First order decay constant [T-1] – Yadav and Jaiswal (2011) |
| *λm* | Source decay constant = [T-1] – chen et al (2016) |
|  | First order decay reaction rate [T-1] – chen et al (2016) |
|  | = – chen et al (2016) |
|  | Release rate of each species from the waste source – chen et al (2016) |