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Introduction

This Supporting Information provides illustration of the piezometer locations at Khulna and Laksmipur (Figures S4 and S5), the 12-month data series of hydraulic head from the three piezometers at each site (Figures S2 and S3), and additional model results showing (i) the effects of lithological layering in the Bengal Aquifer System of the GMB floodplains (Figure S1, Table S1), and (ii) the implications of a range of upper surface boundary conditions on the model results for Khulna and Laksmipur (Figures S6 and S7).

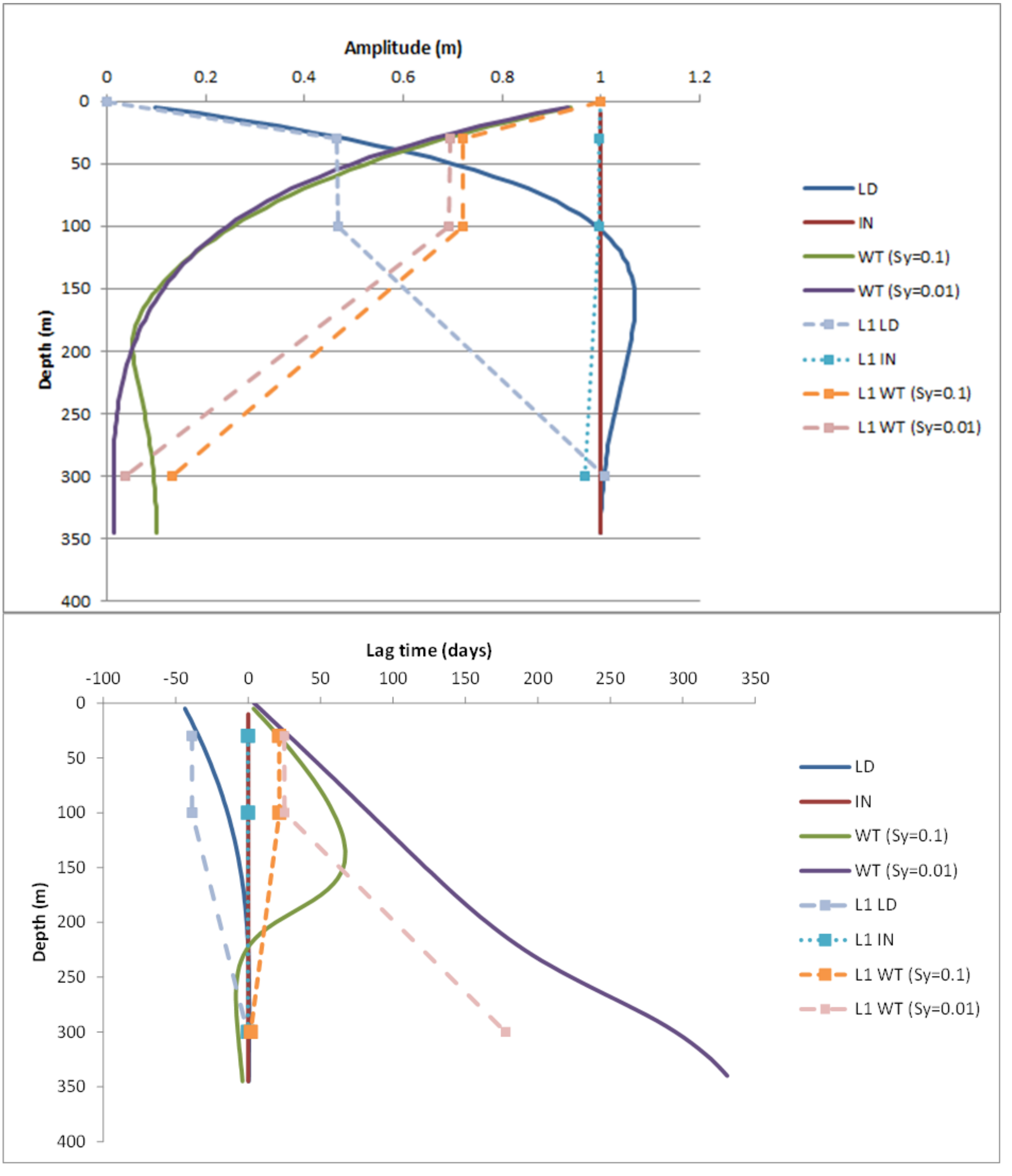

Figure S1. Amplitude (top) and phase lag (bottom) showing the effect of layering (dashed lines) in comparison to the 1D model simulations of the uniform profile (solid lines, as in Fig. 5). The layers are as per Fig. 2 and results are reported at discrete depths (i.e. 30m, 100m and 300m) corresponding to typical monitoring piezometer intervals in the BAS. The amplitude and phase are found by taking the Fast Fourier Transform of the output heads. For the respective amplitude and phase lag of surface vertical displacements, see Table S1.

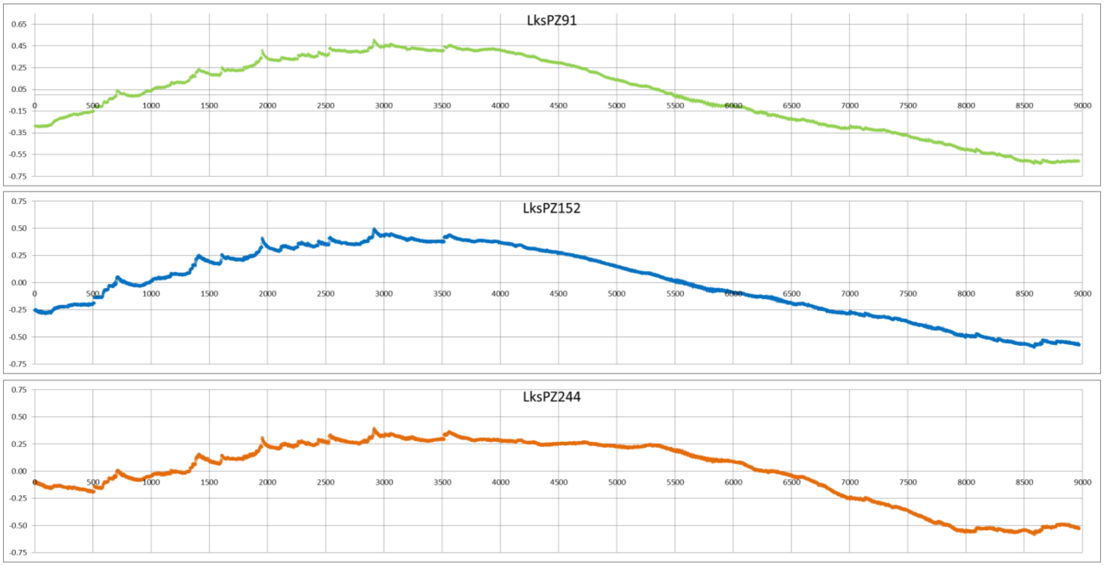

Figure S2. Hourly measurements of groundwater pressure made between May 2013 and June 2014 in three closely-spaced piezometers between 60 and 244 m depth at Laksmipur, Bangladesh, as hydrographs of equivalent freshwater head (the numbers indicate depth to the piezometer screen in metres). Vertical axis is in metres of freshwater head relative to the measurement period average; horizontal axis is hours from the start of monitoring 31st May 2013 at 20:00. Further discussion of the Laksmipur hydrographs is provided by Burgess et al. (2017).

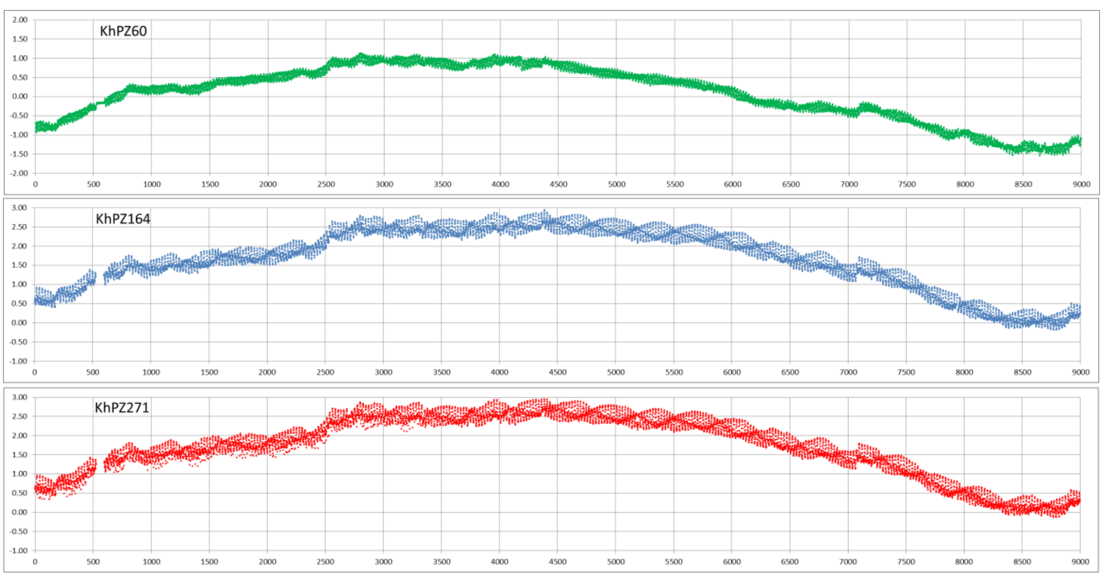

Figure S3. Hourly measurements of groundwater pressure made between May 2013 and June 2014 in three closely-spaced piezometers between 60 and 271 m depth at Khulna, Bangladesh, as hydrographs of equivalent freshwater head (the numbers indicate depth to the piezometer screen in metres). Vertical axis is in metres of freshwater head relative to the measurement period average; horizontal axis is hours from the start of monitoring on 27th April 2013, at 11:30. Further discussion of the Khulna hydrographs is provided by Burgess et al. (2014).

Figure S4. Khulna and the Rupsa River (top); the location of the BWDB compound is indicated. The Khulna BWDB compound and piezometers (bottom, and insets); the arrow marks the piezometers' location. The production boreholes are close to the base of the water tower.

Figure S5. The Laksmipur piezometer site (top, indicated by +) in relation to the Meghna River and Laksmipur town. The Laksmipur piezometers' location in a rural area of tree plantations and scattered ponds is marked by an arrow (bottom and inset).

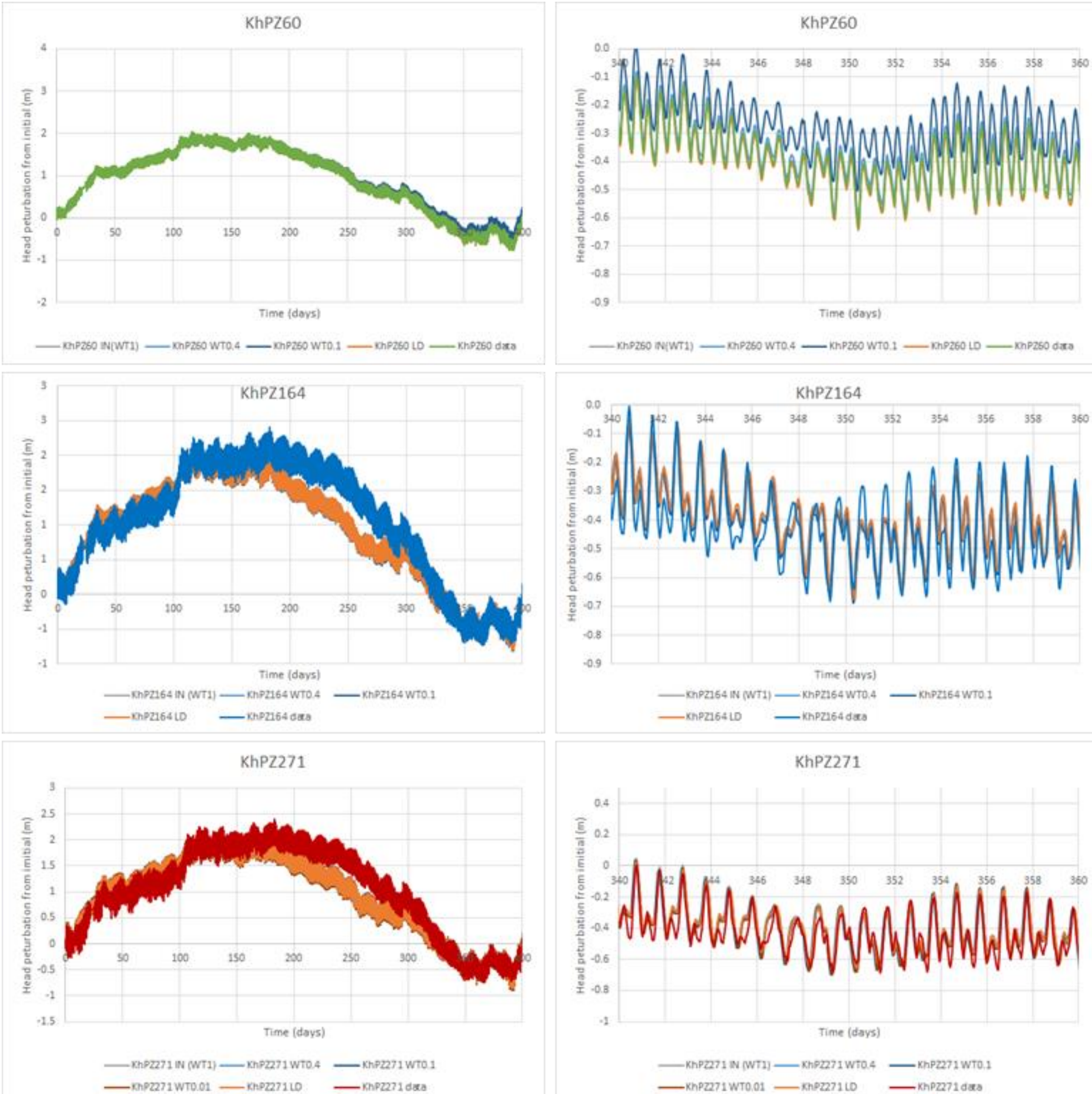

Figure S6. Khulna model simulations compared to data for each piezometer, with upper boundary conditions 'Water table' (WT), 'Load' (LD), and 'Inundation' (IN) as illustrated in Figure 2. The S_y value is given for each WT condition. The small differences between the models are more clearly seen over a shorter time period (right hand column).

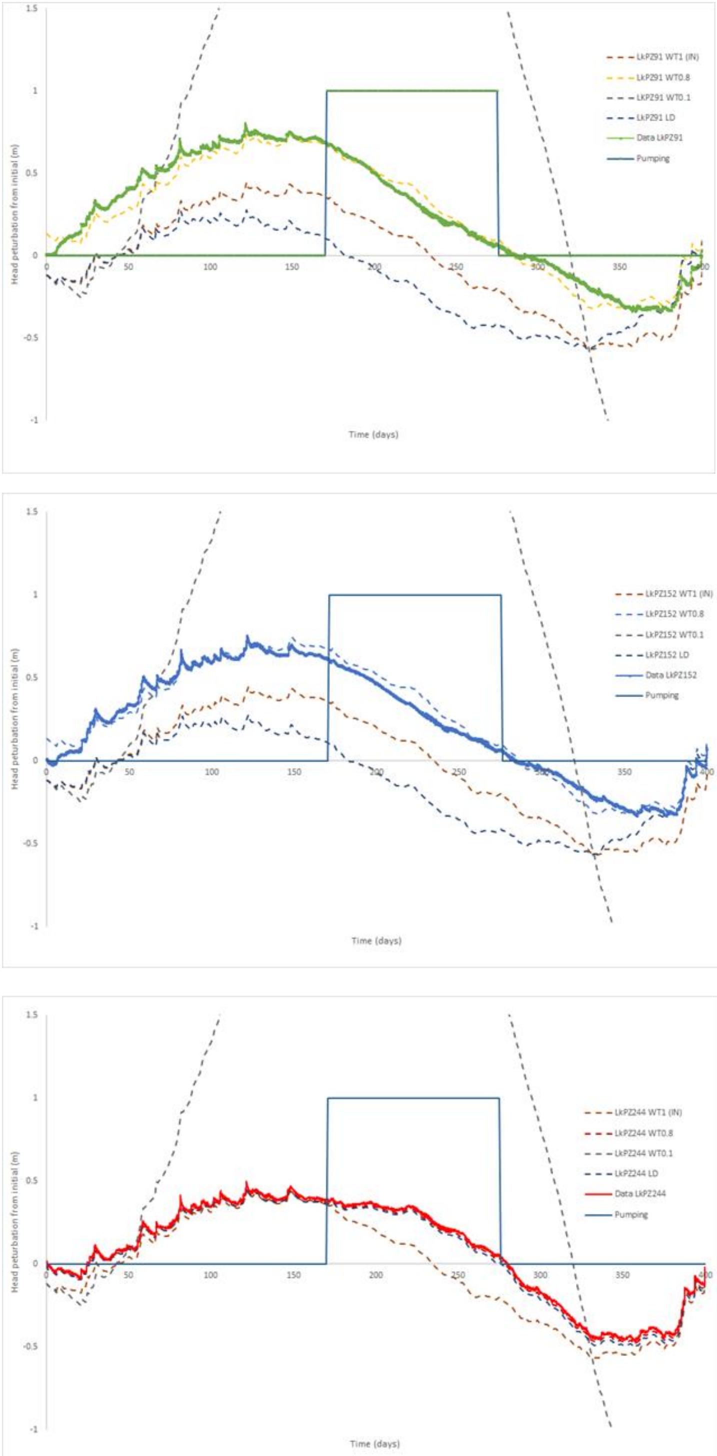

Figure S7. Laksmipur model simulations compared to data for each piezometer, with upper boundary conditions 'Water table' (WT), 'Load' (LD), and 'Inundation' (IN) as illustrated in Fig. 2. The S_y value is given for each WT condition.

	Lag (days)		Amplitude (mm)	
Boundary	Uniform	Layered	Uniform	Layered
LD	141.4	144.0	5.27	3.00
IN	184.0	-178.7	0.38	0.37
WT S_y=0.1	-44.7	-44.2	0.45	0.33
WT S_y=0.01	-44.4	-43.7	4.95	2.72

Table S1. Amplitude (mm) and lag (days) of the surface vertical displacements for the 1D model simulations of the uniform and layered BAS profiles under sinusoidal hydrological loading (for explanation see Sec. 2.5 'Upper boundary conditions' and Sec. 3 'Forward modelling results' of the article). The layers and parameter values are as per Fig. 2. The amplitude and phase are found by taking the Fast Fourier Transform of the output displacements. For the respective amplitude and phase lag of groundwater heads, see Fig. S1.