**Figure S1. UV chromatograms of 1-(4-hydroxy-3-methoxyphenyl)-1,2-propanedione (G-diketone) and 2-hydroxy-1-(4-hydroxy-3-methoxyphenyl)propan-1-one (GP-1) used to aid in identification of aromatics analyzed in this study.**

**Table S1. HPLC analysis of the G-diketone and GP-1 stock solutions**. We assayed purity of our G-diketone and GP-1 stocks via HPLC. No additional peaks were detected in the stock of GP-1. Two additional peaks, corresponding to vanillin and vanillic acid, were detected in the G-diketone stock. Their relative peak areas compared to the G-diketone are presented here.

**Dataset S1. Extracellular aromatic products observed via HPLC during growth on various aromatic substrates.** During our RNA-Seq experiment, we tested the media for presence of extracellular aromatic products. No extracellular aromatic products were detected in the glucose control. The products observed during growth on aromatic substrates with proposed degradation pathways were consistent with those pathways; for example, vanillic acid was detectable in the media of all substrates except for protocatechuic acid. Extracellular vanillic acid was also observed during growth on the G-diketone and GP, while vanillin was additionally observed during growth on GP.

**Figure S2. Neighborhoods of** *N. aromaticivorans* **genes associated with β-O-4 linked aromatic dimer degradation.** Shown are position and genes linked to transcripts with increased abundance when cells were grown in the presence of G-diketone and glucose compared to glucose alone.

**Figure S3. Growth of individual *ligLNDO* deletion strains on glucose and glucose + G-diketone compared to that of a *ΔsacB* parent strain.**