

Description of Additional Supplementary Files

File Name: Supplementary Data 1

Description: Tab 1: List of 51 cell-cycle genes used to calculate proliferation probability; Tab 2-3: List of 40 significantly upregulated genes and 16 significantly downregulated genes in escapees.

File Name: Supplementary Data 2

Description: Hazard ratios and p-values of the Cox proportional hazards analysis. Positive hazard ratios indicate negative correlations with patient survival. Significant genes ($p < 0.05$) are highlighted in bold. *LINC01133* and *TMSB4X* are excluded due to the absence of measurements in the TCGA datasets.

File Name: Supplementary Movie 1

Description: **CDK2 activity in untreated A375 melanoma cells.** A375 cells expressing DHB-mCherry were cultured in phenol-red free full growth media. The CDK2 activity trace for the cell with the yellow arrow is plotted underneath. Red dots mark mitosis.

File Name: Supplementary Movie 2

Description: **CDK2 activity in 10 μ M dabrafenib-treated A375 cells.** A375 cells expressing DHB-mCherry were treated with 10 μ M dabrafenib at the start of the movie. Two different cell behaviors (escapee and non-escapee) are sequentially displayed in this movie: the cell with a yellow arrow is a non-escapee and the corresponding CDK2 activity trace is plotted below in black; the cell with the red arrow is an escapee and the corresponding CDK2 activity trace is plotted below in red. Red dots mark mitosis.

File Name: Supplementary Movie 3

Description: **CDK2 activity in monotherapy or combination therapy-treated A375 cells.** **a**, Untreated A375 cells. **b**, 1 μ M dabrafenib-treated A375 cells. **c**, 10 nM trametinib-treated A375 cells. **d**, A375 cells treated with 1 μ M dabrafenib plus 10 nM trametinib. Cells were imaged in full-growth media for 18 hr before drug addition; the movie was then paused for drug addition and imaging continued for 96 hr with a pause at 48 hr for drug refreshment. Flash indicates time of drug addition.

File Name: Supplementary Movie 4

Description: **CDK2 activity in monotherapy or combination therapy-treated WM278 cells.** **a**, Untreated WM278 cells. **b**, 1 μ M dabrafenib-treated WM278 cells. **c**, 10 nM trametinib-treated WM278 cells. **d**, WM278 cells treated with 1 μ M dabrafenib plus 10 nM trametinib. Cells were imaged in full-growth media for 18 hr before drug addition; the movie was then paused for drug addition and imaging continued for 96 hr with a pause at 48 hr for drug refreshment. Flash indicates time of drug addition.